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I.—*On a Uredine affecting the Himalayan Spruce-fir* (Abies smithiana, *Forbes*).—*By* SURGEON A. BARCLAY, M. B., *Bengal Medical Service.*

[Received December 20th ;—Read January 6th, 1886.]

(With Plates I., II., and III.)

During a short holiday spent in the interior of the Western Himalayas beyond Simla during May, I observed many fir trees (*Abies smithiana*) attacked by a conspicuous parasite which, upon examination, proved to be a uredine—and apparently a new one, for its characters do not correspond with those of any other that I am acquainted with occurring on the *Coniferae.* It occurred in great abundance throughout the forests of the Sutlej valley at elevations of from 7,000 to 10,000 feet. I have not been able to obtain any evidence of its extension eastwards along the Himalayas,* but in a westerly direction Colonel Collett informs me that he has met with it in the Kuram Valley of Afghánistán. He unfortunately did not preserve any specimens, but, from his description of the affection as he saw it there, I think there can be little doubt about its identity.

I have no data to enable me accurately to limit the season during which the parasite conti[illegible]lly recognisable. It was met with in variou[illegible] needles here also throughout May, and I believe it

the neighbouring

e affected

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disappears entirely during the rains in July. Whether the two forms in which it was met with, and which I shall for convenience describe as the æcidial and uredinal, do really stand to one another in this relationship it is impossible to determine without experimental evidence, and I have had no opportunities for performing the necessary experiments. From other circumstances, however, the existence of such relationship appears to be probable. I could find no trace of any teleutosporic form for this parasite either on the same or on any other host. Although I examined many uredo pustules with care, I could never detect any separate form of persistent spore among them. This, however, may have been due to the fact that all the specimens at my disposal for investigation were gathered during May, and, if teleutospores are formed at all in the uredo beds, it is quite possible and probable that they are developed later. The question as to whether the mycelium in either form is perennial requires further investigation. I am mainly influenced in regarding the mycelium in both instances as not perennial by the fact that the affection in both cases is confined entirely to shoots of the present season's growth, as will be more fully explained below, and that the whole of the affected shoot withers and dries up completely when the fungus has completed its existence (fig. 20).

In describing these two forms of the affection, it will be convenient in the first place to give a short account of the general naked eye appearances of each, and then to proceed with the description of their minute characters.

General Appearance of the Æcidial Affection.—When fully developed the affection is very conspicuous: large masses of tissue are affected, and the pale yellow colour of these parts contrasts strikingly with the surrounding green foliage. The fungus always attacks a young terminal shoot, and the distortion caused, partly a real and partly a pseudo-hypertrophy, renders it still more conspicuous. Moreover, the affected part assumes a drooping habit due apparently to the weakening of the texture of the stem by the mycelium which largely pervades its whole tissue.

The general appearance of a young affected shoot is well shown in fig. 17. In this stage, the affected needles lie against one another, embracing the stem instead of standing out from it, as the natural needles are seen to do in the same figure. The stem and needles are already in this young stage considerably thickened. The whole of the affected part has a uniformly pale yellow colour. Conspicuous as it already is, it becom [illegible] when further advanced. The thickening of the needles and s[illegible]tly. The dimensions of the transverse section of a norm[illegible] an average are æcidium is of a pale rose colour, but the free spores in mass are orange-red, whilst the peridium is colourless. The æcidia are first developed on the lowest needles of an affected shoot, whilst in the upper ones they appear in succession from below upwards. They are generally more numerous on the lower than on the upper needles of a shoot. The still unopened æcidia protrude through clean rents in the epidermis, and, when ripe, the peridium bursts with an irregular frayed margin (figs. 3 & 4).

General Appearance of Uredinal Affection.—The uredinal form is much more frequently met with than the æcidial just described. Its general appearance is shown in fig. 19, which represents a fully developed specimen. This specimen had been preserved for a few days in brine, and the needles were swollen somewhat unnaturally. The dimensions of a fully affected needle are 1·60 × 1·43 m.m., thus exceeding those of the æcidial affections. This form occurs sometimes on the same host which bears the æcidial form, but more frequently on a separate tree. Presuming that the uredinal form is genetically related to the æcidial, this would not be surprising, since æcidial fructification is usually less frequently developed than the uredinal. Whenever the æcidial form is met with, it is rarely unaccompanied by the uredinal on the same host. In their general appearances alone, the two affections, when fully developed, differ so much as to enable a distinction to be made between them at a glance (compare figs. 18 & 19). The densely aggregated needles of the uredinal form contrast strikingly with the opener habit in the æcidial form. But, in addition to this difference, the uredinal form is distinguishable by its orange-red colour. It resembles the æcidial affection in always being confined to shoots of the present season's growth, but the affected shoots are always small and never attain the lengths so often seen in the æcidial form. Indeed, the shoots affected by the uredinal form of the parasite appear to be stunted in growth, since no affected shoot ever measures more than 2 inches in length, whilst in the measurements of unaffected shoots (given above in contrasting them with neighbouring shoots affected by the æcidial form) many exceeded this length. The aggregation of the needles also points to a suppression in the long growth of the stem. It is probable, therefore, that, whilst the æcidial parasite stimulates growth in length of the stem, the uredinal one represses it. A specimen gathered from the same host which bore the æcidial affection, and whose measurements were first given above, measured only 2 inches in length though fully developed. The separate needles here also curl up considerably, contrasting strikingly with the neighbouring erect unaffected needles (fig. 19). Every needle of the affected shoot is involved.

about 1 m.m. × 0·76 m.m., but in a fully affected one these become 1·43 m.m. × 1·10 m.m. The needles now curve outwards with their convexities towards the stem, and the æcidia are borne usually in two more or less parallel rows on the upper curved surfaces (fig. 2).

The length of a fully affected shoot varies considerably, from an inch or two to 12 inches or more. In one specimen, a terminal affected shoot measured 9 inches in length, whilst two lateral shoots, also affected and springing from its base, measured 6½ and 5 inches respectively (fig. 1). The measurements of another very fine specimen, gathered from a branch near the summit of a young tree about 15 feet high, were as follows. The small branch upon which the affected shoots occurred sprang immediately from a main lateral branch. This branch contained 15 shoots in all. Their lengths beginning from the base were as follows:—the first 1 inch, the second 1½ inches, the third 2 inches, the fourth and fifth 3 inches, and the sixth 3½ inches. So far all the shoots were quite free of the affection, but the seventh was affected and measured 5 inches, the eighth unaffected 4½ inches, the ninth affected 9 inches, the tenth unaffected 5½ inches, the eleventh affected 8 inches, the twelfth unaffected 6½ inches, and the fifteenth and last affected 12 inches. Thus the affected shoots were on the whole considerably longer than the unaffected. I cannot explain the curious phenomenon here displayed of alternate shoots only becoming affected and with such regularity. The phenomenon becomes even more striking when it is observed that not a single needle on an affected shoot escapes invasion, whilst, on the contrary, no single needle on one of the intervening unaffected shoots, nor any one on the main stem, even in the internodes between affected shoots, is ever attacked in any degree. To all outward appearance, the disease is confined absolutely to shoots of the present season's growth and does not extend to the branch of which it is an immediate shoot, and which was of the preceding season's growth.

As regards the general characters and appearance of the affected needles, they are, as already stated, considerably thickened and curved (fig. 2). The distal end of the needle is densely studded with spermagonia, which appear as minute dark points uniformly distributed all around it. Towards the middle half these become much less numerous, and, as the base is approached, they are few and confined to the inferior surface of the needle. The spermagonia are developed considerably earlier than the æcidia. The general appearance of the æcidia is illustrated in figs. 2 & 3. They are borne mainly on the upper surface of the spine in two parallel rows. In rare cases, they burst through the inferior surface, but such æcidia are isolated and smaller than those on the upper surface (fig. 2 *a*). While still unopened, the

When mature, the needles are clothed densely with a homogeneous orange-red layer of spores forming elevated beds. These masses of spores break out first in isolated spots along the lateral grooves on the upper surface of the needle. Having once broken through the epidermis, they extend in area with great rapidity and soon coalesce. Ultimately, they form two longitudinal beds on the upper surface separated by a narrow groove in the middle line. Laterally, they creep round and involve the lower surface to some extent. After the spores have burst through the upper surface and have made some progress towards coalescence, isolated crops appear in two more or less parallel lines on the lower surface of the needle. These ultimately form oval beds which do not tend to coalesce as on the upper surface. When quite young, this uredinal form emits a disagreeable and offensive odour which is absent from the æcidial form.

Microscopic Characters. (a) *Normal Structure of Needle.*—The normal needle is flattened laterally, and a transverse section is broadly quadrilateral (fig. 21). The extreme length of such a section about the middle of the needle is about 1·09 m.m. and the breadth 0·76 m.m. The two sides forming the upper angle are shorter than the two lower sides, and include a larger angle. On either side, near the surface and about midway between the upper and lower angles, are two resin canals, and in the centre is a vascular bundle measuring 0·236 m.m. in diameter. The needle is covered externally by a layer of epidermis cells whose continuity is interrupted only by the interposition of stomata. In each transverse section, generally six stomata may be seen, two on each of the shorter sides and one on each of the longer ones. Immediately under the epidermis, there is a layer of thick-walled hypodermal cells. This consists of a single row of cells, excepting at the lower angle, where it is double. It is interrupted at the stomata and at the resin canals. These canals are bounded by two layers of cells; the external larger and thicker-walled than the internal. The canals measure about 0·076 m. m. in diameter. The centre of the needle is occupied by the vascular bundle, which in transverse sections is seen to be limited by a circle of oval cells forming an endodermic sheath. Between these sheath cells and the hypoderma, lie large thin-walled parenchyma cells (the mesophyll) with numerous large air spaces. These parenchyma cells, as seen in transverse section, resemble, to some extent, the palisade cells of ordinary leaves and are arranged radially; but this general radial symmetry is interrupted by a secondary crescentic system around each of the resin canals. In depth, these cells vary from two to four cells. They are filled with chlorophyll corpuscles, starch grains, and protein bodies, the relative amounts varying with the season and age of the needles. The sheath cells are considerably longer than they are broad. They do not contain chlorophyll but often large starch grains. Within the endodermic sheath are first thin-walled parenchyma cells, with sinuous outlines opposite the xylem, but more cubical opposite the phlœm. These cells have large bordered pits. The xylem is towards the upper side and the phlœm below it. The xylem is more or less distinctly divided into two lateral halves by two to three or more large thick-walled sclerenchymatous cells. The phlœm is more distinctly divided into two lateral halves. Beyond the phlœm is a group of from three to seven large thick-walled sclerenchyma cells, and, in the centre of this, immediately adjoining the phlœm, one large empty thin-walled cell may always be seen.

(b) *Microscopic Characters of the Æcidial Fungus.*—The general appearance of the invaded tissue of a needle in a transverse section is well shown in fig. 22, and, if this be compared with fig. 21 (exhibiting a transverse section of a normal needle), the general deviations in the structure of the former from the normal condition are at once apparent. The parenchyma cells are larger and rounder than in the normal condition. They measure from 0·177 or 0·101 m.m. in length by 0·058 in width, whilst in the normal needle these dimensions are from 0·093 or 0·071 by 0·035 m. m. The radial arrangement of these cells is also entirely lost, and no vestige of the resin canals remains. The most striking change, however, produced in the invaded tissue is the separation or dislocation of the parenchyma cells from one another by the mycelium. In every transverse or longitudinal section of a needle, it is easy to trace the course of the mycelial filaments for a short distance in the parenchymatous tissue (figs. 5 & 6). In these figures, it will be observed that, though both are magnified equally, the hyphæ of the one are greater in diameter than those of the other. The cause of this difference is due to their different treatment and mounting. Fig. 6 represents a section which was stained in picrocarmine and immediately mounted in Farrant's gum solution, whilst the section represented in fig. 5 was stained with vesuvin, then immersed in absolute alcohol, cleared in clove oil, and mounted in canada balsam. I had no opportunity of examining the tissues when they were quite fresh, and the following measurements of the diameter of the hyphæ are therefore subject to correction. The diameter of the filaments illustrated in fig. 6 (mounted in gum) was on an average $4{\cdot}7\mu$, whilst the average diameter of those represented in fig. 5 was $3{\cdot}1\mu$. The mean of these two measurements would probably very nearly approach a correct measurement of the fresh filaments, for, whilst the former measurement may be a little excessive from absorption of water, the latter is probably reduced by immersion in alcohol. In many places, the mycelial filaments may be seen in parallel lines closely applied to the external surfaces of the parenchyma cells. The main mass of the mycelium, therefore, lies in the parenchymatous tissue, that is, between the hypodermal cells and the endodermic sheath surrounding the central wood bundle. A few filaments may be seen insinuated between the hypodermal cells and reaching the epidermis cells. The extension of the mycelium inwards is largely and conspicuously arrested at the endodermic sheath. Some filaments do, however, pass between the cells of this sheath and may be traced among the parenchyma cells. A very few may be traced in the phlœm, but none in the xylem. A special aggregation of filaments occurs between the phlœm and the cells of the sheath, entirely replacing the central sclerenchyma cells.

The minute structure of the mycelial filaments does not present any special characteristics (fig. 9): they are septate and branched. While coursing through the parenchyma, they are not specially convoluted, but become very much so at the bases of the æcidia and spermagonia. A few haustoria occur in the cells of the parenchyma: they are of the branched type and by no means numerous: as the mycelial filaments are so closely applied to the cell walls, appearing as if cemented to them, there would appear to be little necessity for haustoria.

My specimens were unfortunately not favourable for the investigation of the course of the mycelium in the stem. The mycelial filaments were, however, seen to ramify abundantly both in the cortical tissue and also among the pith cells. The circle of vascular tissue was frequently found to be broken in outline in order to allow of strands of the filaments entering. I was unable to detect any actually between the wood cells. The filaments here presented the same characters as those described above.

Spermagonia.—These, as already stated, occur in great numbers; they are deeply set with their bases beneath the hypoderma, and measure about 0·139 m. m. in length and breadth. The conical neck protrudes 45μ above the level of epidermis (fig. 12). They are of the usual structure and require no description. The mycelium at their bases forms densely convoluted masses which thrust the epidermis and hypodermal cells widely apart. The spermatia are very minute oval bodies (fig. 10).

Æcidiospores.—By reflected light the æcidiospores are pale yellow. They are long irregularly oval bodies densely beset externally with minute spines or tubercles. Many of them are rounder at one extremity than at the other and some are flattened and curved (fig. 7). The dimensions of the dry spores were on an average 38μ by 16μ. These measurements were on the whole very uniformly maintained. After the spores had been moistened with water for a few minutes, their average length became 44μ and their average breadth 21μ. The epispore is thick, measuring about $2{\cdot}1\mu$. Seen in optic section, the epispore appears to be coarsely radially striated, an effect due probably to the overhanging and underlying processes on the surface. The endospore appears to consist of a fine homogeneous membrane, but is ill-defined. The contents are finely granular and yellow (fig. 7).

The spores are given off serially in rows from the hymenium, a small intercalary cell separating successive spores (fig. 8.) Traced from without inwards each successive spore becomes smaller, until at last no distinction can be made between spore and intercalary cell, and these merge gradually into the round basidial cells forming the floor of the hymenium.

The peridium is very resistant and consists of two layers of cells which are considerably larger than the spores (fig. 16).

(c) *Microscopic Characters of the Uredinal Fungus.*—The general distribution of the mycelium in the tissue of the needle is shown in figs. 23 and 25, which represent transverse sections. Masses of mycelial filaments occur between the cells of the parenchymatous tissue. The dislocation of the cells by the mycelium is much more uniform and symmetrical than in the case of the æcidial affection, where special aggregations are apt to occur at certain places. The filaments in this form are also much more convoluted. Both in transverse and longitudinal sections the masses of mycelium present the appearance of confused more or less circular outlines resembling a pseudoparenchyma. This appearance is due to the extreme convolution of the filaments and to their frequent branching (fig. 14). The majority of the hyphæ have a greater diameter than those of the æcidial form; but they vary in this respect greatly. Most of the hyphæ measure about 8μ in breadth, but some are to be seen of half that size (fig. 13, *a* & *b*.)

In this form, as in the last, the great mass of the mycelium is confined to the parenchymatous tissue. The arrest of the filaments at the sheath enclosing the central wood bundle is very abrupt, more so even than in the æcidial form, for the continuity of the cells is scarcely at all broken (fig. 25). Some filaments, however, do pass through and may be traced both between the parenchymatous cells and to a lesser extent within the phlœm. In this form, also, the central sclerenchyma cells are replaced by a mass of convoluted mycelium. In every transverse section, the single large empty cell noted in the description of the normal needle may be seen between this mass of mycelium and the phlœm. Elsewhere within the central bundle, the hyphæ are less numerous and arranged in a more or less scalariform manner. In this uredinal form, the mycelial filaments do not closely encase the parenchyma cells, as they were shown to do in the æcidial form, and haustoria are numerous. They are all of the branched type: after penetrating the cell the hypha forms three or more apical branches (fig. 11). They are most numerous in the outer parenchymatous cells and chiefly in the most external ones; but they are also to be seen within the cells of the sheath and in the parenchyma cells immediately under these.

Uredo-spores.—As already stated, four patches of spore extrusion may be seen in every transverse section of a fully affected needle (fig. 23), the two larger ones being superior. In such transverse sections, it will be observed that the proportion of the circumference involved in spore formation is very large: about $\frac{8}{13}$ths of the circumference being thus involved. The epidermal layer generally ends abruptly at some distance from the spore bed (fig. 23). There must be a considerable loss of epidermis involved in this sporing process, for the circumference of a normal needle at its middle is to so much of the circumference of an affected needle as is still covered with epidermis as 13·5 to 9·0. As regards the hypertrophy of the needles affected, it may be noted that, as the circumference of the transverse section of an affected needle at its middle was 26 units, whilst that of a normal needle at its middle was 13, the area of the former is four times that of the latter. But, as I have already stated, the specimens were not examined until they had been some days in brine, which seems to have swollen them to some slight extent.

At the bases of these spore beds, the hyphæ form as usual densely convoluted masses (fig. 25). The basidial cells composing the bases of the spore beds form a more or less irregular line of cells containing orange-red oil globules. These oil globules are more numerous in the more superficial parts. The whole thickness of the orange coloured bed is about 0·127 m. m. The basal cells which arise directly from the mycelium are large, nucleated, and of various sizes and shapes: the diameter of an average-sized cell was found to be 16μ (fig. 15 *a*). These cells may be stained with carmine though not brilliantly: the rest of the fungal elements do not take the stain at all. By division a row of such cells are formed (fig. 15 *b*.) The end cell of such a row throws out a finger like protrusion (fig. 15 *c*) from which the spores are separated by transverse septation. The spores (fig. 15 *d*) are spherical with their walls destitute of any surface markings. Their contents are granular and of an orange-red colour. The moistened spores measured on an average $9{\cdot}5\mu$ in diameter.

Such then is a very imperfect account of one of the most curious and striking of the many forms of Uredineæ which occur on the Himalayas. The fungus was first met with in May 1884, and the above

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account of it written immediately afterwards; but its publication was deferred in the hope that further opportunities might have been afforded me of investigating its life history. This hope I have now reluctantly abandoned, as my official engagements have not allowed me another opportunity of visiting the forests in which it occurs. The above description of its morphological characters in one stage of its existence may, however, prove of some interest and may attract the attention of others with greater opportunities and leisure than I have of following its developmental history, and is therefore published as it stands. A continued study of it is much to be desired, if only from an economic point of view, for the affection must prove very destructive to these valuable timber trees. Apart from the diversion of nutriment it must occasion, the habit it has of attacking new growing shoots and so completely involving them as to destroy them must be most injurious to these trees. I have on several occasions seen young trees (seedlings) not only with their terminal shoots involved by it, but also with many of their lateral shoots attacked at the same time.

Note.—After I had completed this paper I chanced to read, in an Appendix (B) to Hooker's "Himalayan Journals," published in 1854, of the occurrence in the Sikhim Himalayas of what may prove to be the same fungus though in some respects the description given of it does not agree with the characters of the form I have above described. It is there stated:—"A very fine Æcidium also infests the fir tree (*Abies smithiana*) a figure of which has been given in the 'Gardener's Chronicle' 1852, p. 627, under the name *Æcidium Thomsoni*. This is allied to the Hexenbesen of the German forests but is a finer species and quite distinct." I have unfortunately not been able to refer directly to this paper, but am indebted to the kindness of a friend for the following *résumé* of it. The fungus was gathered by Dr. Thomson at an elevation of 8,000 feet in the Northern Himalayas on *Abies smithiana*. The affected leaves are reduced in length nearly one half and curved. The whole upper surface is occupied by one or more large, elevated, more or less elongated sori sometimes disposed in two rows "which must give the diseased tree a very strange appearance and at length prove fatal. The spores are greatly elongated often exceeding $\frac{1}{800}$″ in length. They were found to be mixed with mucedinous filaments some of which were ready to fructify." These were thought to be extraneous and to belong probably to some *Penicillium*. Dried specimens like other allied parasites had a smell of violets. The paper is very short, and the data given are not sufficient to allow of any decision being come to regarding the identity of the fungus with the form above described.

EXPLANATION OF THE PLATES.

PLATE I.

1. Outline sketch, natural size, of three affected shoots (æcidium).

2. Needle showing fully developed æcidial fructification, about twice the natural size: æcidia in two rows on upper surface, excepting one at *a* on the lower surface.

3. Young æcidium emerging through a rent in the epidermis, with two spermagonia—slightly magnified.

4. Showing mode in which pseudoperidium bursts: slightly magnified.

5. Matting of mycelial filaments on surface of a parenchyma cell × 250. Transverse section.

6. The same × 250. Longitudinal section.

7. Æcidiospore × 580.

8. Æcidiospores with intercalary cells towards base of a series × 450.

9. Fragments of hyphæ in an air space × 450.

10. Spermatia × 580.

11. Haustorium in transverse section within a parenchyma cell × 250 (uredinal affection).

PLATE II.

12. Spermagonium: transverse section × 250.

13. *a*. Portions of hyphæ from a longitudinal section of needle affected with uredinal fungus × 250. *b*. The same × 580.

14. Convoluted mass of mycelium between parenchyma cells (uredo) × 430. Transverse section.

15. *a*. Basal cubical cells with nuclei (nucleus dividing in one which springs directly from a hypha) × 580. *b*. Round basal cells in series × 580. *c*. Basal cells with finger-like protrusions preparatory to formation of spores × 580. *d*. Free uredo-spores × 580.

16. Peridial cells × 340.

PLATE III (Photographs).

17. General appearance of young shoots in an early stage of infection by the æcidial fungus, before the pustules have protruded through the epidermis.

18. The same when the fungus is fully developed.

19. General appearance of a shoot attacked by the uredinal fungus: fully developed.

20. Appearance of withered and dried up shoot after the death of the fungus.

(N. B. The four preceding figures about ⅔ natural size.)

21. Transverse section of normal needle of *Abies smithiana*.

22. Transverse section of needle affected by æcidial fungus (the peridium with the enclosed æcidiospores has accidentally become detached).

23. Transverse section of needle affected by uredinal fungus showing four beds of spores.

24. Transverse section of needle affected by *Chrysomyxa abietis* (?) introduced for comparison with Figs. 22 and 23 as practically normal in all respects excepting the protruding fructification.

(N. B. The three preceding figures all magnified to the same extent.)

25. Transverse section of needle affected with uredinal fungus more highly magnified than Fig. 23 and illustrating several points referred to in the text; more especially the dislocation of the parenchyma cells and the comparatively undisturbed condition of the tissues within the endodermal sheath.

II.—*Notes on Indian* Rhynchota. No. 5.—*By* E. T. ATKINSON, B. A., PRESIDENT.

[Received August 11th ;—Read November 4th, 1885.]

Subfamily EURYBRACHYDINA, Stål.

Eurybrachydida, Stål, Hem. Afric. iv, p. 129 (1866) : *Eurybrachydina*, Ofvers. K. V.-A. Förh. p. 753 (1870).

Anal area of wings very rarely reticulate, when so, clypeus convex without lateral ridges : last tibiæ without a mobile spur at the apex. Frons broad, transverse or almost equally long and broad, amplified on both sides in a distinct angle : anterior feet compressed, more or less dilated : anal area of wings sometimes reticulated *(Stål)*.

Stål distributes the genera included in this subfamily into two great groups :—

(1) those in which the eyes beneath are spinose.

(2) those in which the eyes beneath are unarmed.

a. Genera furnished with eyes spinose beneath.

I. Wings less ample, not or scarcely broader than the tegmina : head very broad ; antennæ briefly cylindrical ; eyes beneath very distinctly spinose ; clavus very broad at the apex.

A. Head very slightly prominulous before the eyes ; genæ narrower ; frons scarcely or only a little broader than the thorax ; last pair of tibiæ 5-spinose :—*Eurybrachys*, Guérin.

B. Head more prominulous before the eyes ; genæ broader ; frons distinctly broader than the thorax ; vertex scarcely or only a little shorter than the thorax ; last pair of tibiæ 6-spinose :—*Messena*, Stål.

II. Wings ample, broader than the tegmina.

A. Vertex distinctly sinuate at the base : lateral angles of frons much produced ; antennæ briefly cylindrical ; clavus broad at the apex, two longitudinal veins separated through their whole length : median longitudinal area of wings dilated, furnished almost entirely with transverse veins ; last pair of tibiæ 6-spinose :—*Thessitus*, Walker.

B. Vertex very slightly sinuate at the base or truncated : lateral angles of frons somewhat straight, less produced than in *Thessitus*, Walker : clavus narrowly open at the apex, the longitudinal veins united nearly in the middle ; wings without a dilated area.

a. Head hardly broader than the thorax, vertex truncated at the base ; second joint of the antennæ very briefly subcylindrical ; last pair of tibiæ 5-spinose :—*Loxocephala*, Schaum.

b. Head narrower than the thorax, vertex subsinuate at the base ; second joint of the antennæ subglobose : last pair of tibiæ normally 4-spinose :—*Nesis*, Stål.

b. Genera furnished with eyes unarmed beneath and clavus closed at the apex, somewhat acute.

1 (2). Last pair of tibiæ usually 6-spinose; scutellum longer by half than the thorax: antennæ short, second joint subglobose:—*Frutis*, Stål:—type *F. pulchra*, Gray.

2 (1). Last pair of tibiæ normally 3-spinose.

3 (8). Frons transverse, angulated on both sides.

4 (7). Thorax and scutellum together distinctly shorter than the breadth.

5 (5). Antennæ short, not extending beyond the eyes:—*Olonia*, Stål:—*O. apicalis*, Walker, from Australia.

6 (5). Antennæ cylindrical, longer, extending beyond the eyes, tegmina narrowed towards the apex:—*Dardus*, Stål:—*D. bufo*, Walker, from Australia.

7 (4). Thorax and scutellum together equally long and broad: antennæ short:—*Platybrachys*, Stål:—*P. leucostigma*, Walker, from Australia.

8 (3). Frons scarcely broader than long, roundly-amplified on both sides; lateral angles of vertex ascending: antennæ subcylindrical, long, extending much beyond the eyes; tegmina narrowed towards the apex (wings absent?):—*Gedrosia*, Stål:—*G. varia*, Walker, from Australia.

These do not include the whole of the genera falling under this subfamily, but are enough for our purposes.

Genus EURYBRACHYS, Guérin, Stål.

Guérin, Voy. Bélanger Ind. Orient. p. 475 (1834); Burm., Handb. Ent. ii (i) p. 149 (1835); Spinola, A. S. E. F. (1 sér.) viii, p. 367 (1839); Walker, List. Hom. B. M. ii, p. 381 (1851): Stål, Stettin Ent. Zeit. xxiv, p. 245 (1863).

Guérin's diagnosis of the genus is as follows:—'Antennæ rather long, extending a little beyond the sides of the frons, the first joint short, the second long, granulate, cylindrical, a little rounded at the tip, at least thrice longer than broad, with the filamentous portion of the antennæ inserted at the extremity and very near the eyes: ocelli apparently absent: frons transverse, the anterior portion in form of a transverse lozenge, flat, ecarinate: labrum small, triangular: rostrum short, reaching barely the intermediate coxæ: thorax transverse, with the anterior lobe a little narrower: tegmina a little longer than the abdomen, dilated at their base, and a little contracted at the extremity: abdomen as high as broad: feet rather long, spinose; anterior and intermediate tibiæ flattened and dilated.

1. EURYBRACHYS VENUSTA, Stål.

Eurybrachys venusta, Stål, Stettin Ent. Zeit. xxiv, p. 245 (1863).

♀. Sanguineous; head, thorax anteriorly and barely basal half of tegmina olivaceous-green; the basal half of the tegmina spotted fuscous, and the base itself, sanguineous; corium behind the middle and commissural limbus of clavus, greyish, veined subolivaceous; wings whitish, subsanguineous at the base and veined sanguineous: abdomen sordid stramineous (sanguineous when alive?), beneath banded black. In stature like *E. tomentosa*, Fabr., differs in having the tegmina more distinctly and densely veined behind the middle. Tegmina twice longer than broad, subcoriaceous before the middle, opaque *(Stål)*. Long, 10; exp. teg., 25 millims.

Reported from Nilgiris.

2. EURYBRACHYS TOMENTOSA, Fabricius.

Cicada tomentosa, Fabricius, Syst. Ent. ii, p. 683 (1775); Spec. Ins. ii, p. 324 (1781); Mant. Ins. ii, p. 269 (1787); Ent. Syst. iv, p. 30 (1794).

Lystra tomentosa, Fabricius, Syst. Rhyng. p. 60 (1803); Germar in Thon's Archiv. ii, fasc. 2, p. 55 (1830).

Eurybrachys tomentosa, Burm., Handb. Ent. ii (i) p. 150 (1835); Am. & Serv., Hist. Nat. Ins. Hém. p. 517 (1843); Walker, List. Hom. B. M. ii, p. 381 (1851); Stål, Hem. Fabr. ii, p. 100 (1869).

♀. Green-olivaceous; tegmina olivaceous-green, with small scattered spots and two oblique bands, flavescent, apical part flavescent-greyish; small apical spots arranged in two transverse rows and a larger spot at the commissure, black, shining: wings whitish, a band abbreviated inwards behind the middle and a band continued through, placed near the apex, black: pectus and feet sanguineous, tibiæ and last pair of tarsi infuscate; abdomen croceous, disc of venter, black. Closely allied to *E. spinosa*, Fabr., differs in the head a little broader, almost broader than the thorax, tegmina more ample, much spotted in rows at the apex, wings adorned with a band running through them near the apex, not by a small spot, and the first pair of tibiæ above a little more dilated *(Stål)*. Exp. teg., 24; broad, 4 millims.

Reported from Sumatra, India: *E. fraterna*, Stål [Ofvers. K. V.-A. Förh. p. 450 (1858)], from Ceylon is hardly distinguishable from *E. tomentosa*, Fabr.

3. EURYBRACHYS BIMACULATA, Fabricius.

Lystra 2-maculata, Fabricius, Syst. Rhyng. p. 60 (1803).

Lystra bimaculata, Germar, in Thon's Arch. ii, fasc. 2, p. 55, (1830.)

Eurybrachys bimaculata, Stål, Hem. Fabr. ii, p. 100 (1869).

♂. Weakly greyish-olivaceous; tegmina concolorous, pellucid, remotely and very obsoletely sprinkled fuscous; a spot behind the apex of the clavus and minute apical spots arranged in two transverse rows, black, shining: wings very pale olivaceous-greyish hyaline, colourless towards the apex and adorned with two black bands, the one short reaching the exterior margin, the other running through the wing; interior limbus slightly infuscate before the middle: feet weakly, sordid sanguineous, sprinkled fuscous; tibiæ and last pair of tarsi, black: venter black, margined flavescent. Very closely allied to *E. tomentosa*, Fabr., coloration excepted, differs hardly except in the tegmina being a little narrower *(Stål)*. Long, 6; exp. teg., 20; broad, 3½ millims.

Reported from Tranquebar.

4. EURYBRACHYS SPINOSA, Fabricius.

Cicada spinosa, Fabr., Ent. Syst. Suppt. p. 520 (1798); Coquebert, Ill. ii, p. 45, t. 9, f. 4 (1790).

Lystra spinosa, Fabr., Syst. Rhyng., p. 58 (1803).

Eurybrachys spinosa, Burm., Handb. Ent. ii, (i), p. 150 (1835); Spinola, A. S. E. F. (1 sér.) viii, p. 369 (1839).

Frons large, blunt, yellow: eyes ferruginous, prominulous, furnished with a small acute, prominent, spine: head and thorax obscure: tegmina deflexed, green, with three whitish oblique bands: feet sanguineous *(Fabr.)*. Similar to *E. tomentosa*, Fabr., but tegmina shorter, broader and without an apical transverse line of black dots *(Burm.)*. Long, 8½ millims.

Reported from India, Mauritius.

5. EURYBRACHYS LEPELLETIERI, Guérin.

Eurybrachys lepelletieri, Guérin, Voy. Bélanger Ind-Orient. p. 476 (1834); Spinola, A. S. E. F. (1 sér.) viii, p. 369 (1839); Walker, List Hom. B. M. ii, p. 381 (1851).

♂. Rufous: head transverse, broad, with the anterior part of the frons flat, of a golden yellow: antennæ rufous: eyes whitish, prominulous, with a small acute prominent spine: thorax trapeziform of a somewhat pale yellow; tegmina of the same colour with a broad oblique rosy band, pointed towards the side, losing itself in the yellow in front, near the end another less marked band, a little reddish: wings white: body beneath and feet rosy red: abdomen yellowish *(Guérin)*. Body long, 7; exp. teg., 19 millims.

Reported from Bengal: resembles *E. spinosa*, Fabr., in form and size, but differs in the coloration of the tegmina.

6. EURYBRACHYS PUNCTIFERA, Walker.

Eurybrachys punctifera, Walker, List Hom. B. M. ii, p. 383 (1851); Distant, J. A. S. B. xlviii, (2), p. 38 (1879).

♂. Body fawn-colour, irregularly dotted with brown and black; head nearly as broad as the thorax; vertex very slightly arched, much broader than twice its length; frons stramineous with small ferruginous marks, transversely angular towards the clypeus where it is sinuate; its breadth about twice its length: clypeus lanceolate, ferruginous, at the base stramineous: rostrum tawny, reaching a little beyond the middle coxæ: fore-chest rounded in front, straight behind, not longer than the vertex, its breadth about four times its length: middle-chest longer than the fore-chest indistinctly 5-carinate: scutellum small, triangular, posteriorly acute: pectus pale stramineous: abdomen obconical, a little shorter than the thorax, banded with black towards the tip; anal appendages black: legs pale stramineous, mottled with black, especially on the fore legs: femora tinged with very pale green, with a few brown dots; only the tips of the fore-femora marked with black; hind tibiæ 6-spinose; tips of spines, black: tegmina fawn-colour, colourless towards the apex, adorned with black dots which are larger, more numerous, and more distinct towards the tips; veins tawny: wings almost colourless, each with a large black spot near the tip and a smaller one on the hind border at three-fourths its length; veins very pale green (*Walker*). Body long, 10½; teg., 37½ millims.

Reported from Madras; the Indian Museum has a specimen from Tenasserim.

7. EURYBRACHYS (?) RUBRICINCTA, Walker.

Eurybrachys rubricincta, Walker, Ins. Saund. Hom. p. 46 (1858).

Testaceous: vertex transverse, short, slightly arched, with a brown dot on each side; frons flat, smooth, transverse, dilated and angular on each side; face small: thorax slightly marked brown; pronotum slightly rounded in front with a slight median ridge; mesonotum slightly tricarinate; metanotum bright crimson: legs bright red, anterior legs much dilated: tegmina pale luteous, whitish at the tips with three spotted green bands; some black marks on the veins, three black dots near the anterior angle and two black submarginal points: wings snow-white with two black spots in front, the second almost apical. The abdomen in ♂ is furnished with foliaceous appendages; in ♀, towards the tip, with a bundle of snow-white filaments (*Walker*). Body long, 7¼; teg., 16½ millims.

Reported from N. India.

8. EURYBRACHYS (?) RUBRESCENS, Walker.

Eurybrachys rubrescens, Walker, Trans. Linn. Soc. Zool. i, p. 88 (1856).

Testaceous: head, vertex, and thorax with reddish marks: frons greenish testaceous: legs rosy red: tegmina pubescent, slightly tuberculated, with a black shining dot near the tip of the costa and at three-quarters of the length of the hind border, purplish red, and with black dots towards the base, tawny towards the tips, with a dingy hyaline median band and the borders chiefly of the same colour: wings milky white with a brown band (*Walker*). Body long, 10½; teg., 37—38 millims.

Reported from Mount Ophir, Singapore.

9. EURYBRACHYS SUBFASCIATA, Walker.

Eurybrachys subfasciata, Walker, List Hom. B. M. ii, p. 391 (1851).
Issus apicalis, Walker, l. c. p. 368 (1851).

♂, ♀. Body short, broad, testaceous, sprinkled with a darker colour: head as broad as the thorax: vertex very slightly arched with an indistinct ridge along the border, six times broader than long; frons short, flat, forming an acute angle on each side, not sinuate where it joins the clypeus but forming an obtuse inward angle on each side near which it has two slight oblique furrows; more than twice broader than long: clypeus triangular, slightly rounded: rostrum ferruginous: eyes spinose: fore-chest very slightly rounded anteriorly, straight behind, a little longer than the frons: middle-chest longer than the fore-chest, subtriangular, its hinder sides sinuate: pectus and metanotum red: abdomen obconical as long as the thorax: fore and middle legs red, very broad; hind legs slender, dark red, hind femora mostly pale yellow, hind tibiæ 4-spinose, tips of spines, black: tegmina pale ferruginous, partly tawny, adorned at the tips with a few black spots of various size and varying in each specimen; veins ferruginous: wings almost colourless or slightly tinged with brown, blackish with a white band towards the tips; veins tawny (*Walker*). Body long, 5-6½; teg., 15—16½ millims.

Reported from India, N. Bengal.

Genus MESSENA, Stål.

Stettin Ent. Zeit. xxii, p. 246 (1863): see p. 10.

10. MESSENA PULVEROSA, Hope.

Eurybrachys pulverosa, Hope, Trans. Linn. Soc. xix, p. 134, t. 12, f. 7*a*, *b*, (1845); Walker, List. Hom. B. M. ii, p. 382 (1851).

Messena pulverosa, Stål, Rio. Jan. Hem. ii, p. 67 (1862); Stettin Ent. Zeit. xxiv, p. 246 (1863).

Shining whitish: head and thorax yellow, abdomen concolorous, having the end clothed with a white cottony substance: basal half of tegmina virescent, apices fuscous-hyaline, sparingly spotted: wings whitish, with an irregular black spot at the anterior margin and other minute spots of the same colour placed posteriorly: first and intermediate pairs of feet of a red-lead colour, last pair fuscous *(Hope)*. Body long, 14½; exp. teg., 55 millims.

Reported from Silhat: the Indian Museum has a specimen, locality unknown.

11. MESSENA NEBULOSA, Stål.

Messena nebulosa, Stål, Stettin Ent. Zeit. xxiv, p. 246 (1863).

♀. Pale fawn-colour; tegmina sordid whitish, veined fawn-colour: towards the base fawn-colour or (especially beneath) weakly violaceous-ferruginous, behind the middle clouded and sprinkled pale-fuscescent; adorned near the apex in the middle of the apical part with a spot and at the commissural margin, some distance behind the middle, with two spots (the posterior minute) or with one spot, black; sometimes sparingly sprinkled fuscous before the middle: wings whitish, obsoletely banded with fuscescent behind the middle, near the apex with some small black-fuscous spots which are sometimes wanting: abdomen (when alive ?) sanguineous; apex of the anterior femora and the first pair of tibiæ sprinkled fuscous, entire anterior tarsi and the last pair behind the middle, black-fuscous. Closely allied to *M. pulverosa*, Hope, tegmina and wings narrower, the former are not amplified towards the apex and are 2½ times longer than the breadth *(Stål)*. Long, 15; exp. teg., 47—50 millims.

Reported from Cambodia, Malacca and Perak (?).

Genus THESSITUS, Walker.

Thessitus, Walker, Journ. Ent. i, p. 307 (1862); Stål, Ofvers, K. V.-A. Förh. p. 753 (1870): *Thessita*, Stål, Stettin Ent. Zeit. xxii, pp. 246-247, (1863): see p. 10.

Sec. A. Vertex shorter than breadth by about one-half, deeply sinuate at the base, truncated at the apex, lateral margins obtusely elevated in the middle; frons near the base furnished with a transverse, arched, distinct ridge, lateral angles much produced, rounded at the apex, lateral margins above and beneath those angles slightly sinuate; infraocular spines short, scarcely visible from above: wings slightly narrowed towards the apex, apex broadly rounded. To this section belong *T. insignis*, Westwood, and *T. mortuifolia*, Walker.

Sec. B. Vertex less deeply sinuate at the base, apex broadly rounded; frons furnished near the base with a straight obsolete ridge, parallel to the basal margin, lateral angles rounded at the apex, lateral margins above those angles slightly sinuate, beneath them straight; infraocular spines somewhat largish, very prominent; wings more narrowed towards the apex than in section A. The *T. nigro-notata*, Stål, belongs to this section.

12. THESSITUS INSIGNIS, Westwood.

Eurybrachys insignis, Westwood, A. M. N. H. ix, p. 119 (1842); Hope, Trans. Linn. Soc. xix, p. 134, t. 12, f. 9 (1845); Walker, List. Hom. B. M. ii, p. 382 (1851); J. Linn. Soc. Zool. i, p. 155 (1857); l. c. x, p. 133 (1867).

Eurybrachys multicolor, Walker, J. Linn. Soc. Zool. i, p. 88 (1856).

Thessita insignis, Stål, Stettin Ent. Zeit. xxiv, p. 247 (1863).

Thessitus insignis, Stål, Ofvers. K. V.-A. Förh. p. 753 (1870).

Shining white: head and thorax yellow, sides of abdomen sanguineous: tegmina flavescent, sprinkled with various minute black spots: wings whitish, with an irregular black spot at the anterior margin and other minute spots of the same colour posteriorly: anterior feet fuscous-yellow, posterior green, spines on tibiæ, blackish (*Hope*). Body long, 14½; exp. teg., 54 millims.

Reported from Malabar; Philippines; Sumatra.

13. THESSITUS MORTUIFOLIA, Walker.

Thessitus mortuifolia, Walker, Journ. Ent. i, p. 307, t. 15, f. 4 (1862).

Thessita mortuifolia, Stål, Stettin Ent. Zeit. xxiv, p. 247 (1863).

♂. Fawn colour, tibiæ verging into olivaceous, first pair sprinkled fuscous: tegmina pellucid-greyish, veined fuscous and subolivaceous, marked with black spots and small black transverse lines at the margins; entire clavus and oblique basal part of corium olivaceous-virescent, corium adorned behind the virescent part with a very oblique sanguineous patch which does not reach the costal margin: wings whitish, furnished near the apex with 5-6 black spots, two larger and sometimes confluent. In stature very similar to *T. insignis*, Westwood; tegmina more than twice longer than broad, not amplified towards the apex, the apex obliquely rounded, costal margin slightly sinuate in the middle (*Stål*). Long, 14; exp. teg., 50 millims.

Reported from Cambodia: the Indian Museum has a specimen from Perak.

14. THESSITUS NIGRO-NOTATUS, Stål.

Thessita nigro-notata, Stål, Stettin Ent. Zeit. xxiv, p. 247 (1863).

♂. Fawn-colour: basal spot on clypeus, band on frons placed a little beneath the middle, abbreviated and interrupted in the middle, a band a little above the middle running between the lateral angles and twice broadly interrupted, and small confluent spots placed at the basal margin and above the subbasal ridge, two spots on the genæ (one basal, the other apical), five spots on the vertex, antennæ, two anterior and one lateral spot on the thorax, four small subbasal spots on the scutellum, apical spots on the first pair of femora and spots on the anterior tibiæ, black: tegmina towards the base more obscure, sparingly sprinkled black and adorned with a sanguineous line near the costal margin before the middle; costal margin behind the middle and the apical margin marked with small black spots: wings weakly fuscescent, veined obsoletely violaceous, apical part sordid whitish, marked by a large spot (sometimes divided into two) and several minute marginal spots, black-fuscous: last pair of tibiæ infuscate. Vertex more than twice broader than long: tegmina slightly amplified towards the apex, obtusely obliquely rounded at the apex: tibiæ 5—6 spinose (*Stål*). Long, 11; exp. teg., 32 millims.

Reported from Malacca, Tenasserim.

Genus Loxocephala, Schaum.

Ersch & Gruber, Allg. Ency. Wissen & Künste, art. Fulgoridæ, sec. 51, p. 71 (1850): see p. 10.

15. Loxocephala æruginosa, Hope.

Lystra æruginosa, Hope, Trans. Linn. Soc. xviii, p. 443, t. 31, f. 1 (1841).

Eurybrachys æruginosa, Walker, List Hom. B. M. ii, p. 382 (1851).

Loxocephala æruginosa, Schaum, Allg. Enc. Wissen. & Kunste sec. 51, p. 71 (1850).

Body above and head green; face flat, anterior margin acutely curved, frontal ridge between the eyes parallel with the anterior margin: tegmina sordid fulvescent varied with green and black; margins externally dull black; basal half irrorated; apical half with a large round spot before the apex and the apex, black: wings powdered white: feet sanguineous (*Hope*). Long, 27¼; broad, 8½ millims.

Reported from Silhat. In a specimen in the Indian Museum from Sikkim the dull black margin to the apex is wanting or obsolete.

16. Loxocephala decora, Walker.

Eurybrachys decora, Walker, List Hom. B. M. ii, p. 382 (1851).

♂. Body green: head nearly as broad as the thorax; vertex with a rim which is black in front and behind, slightly rounded anteriorly, very slightly sinuate posteriorly, about three times broader than long; frons large, scutcheon-shaped, much broader than long, surrounded by a slight rim; clypeus small: rostrum tawny: pronotum hardly longer than the vertex, nearly straight behind, slightly rounded on fore-border along which there is a black band; thrice broader than long: mesonotum short, hardly longer than the pronotum, nearly triangular, with a black interrupted band in front: abdomen obconical, much longer than the thorax: legs red; fore legs rather broad and flat, fore tibiæ striped black, feet partly black: tegmina green with an oblique black band at the base, black along the tips, near which there is another oblique black band in the disc, two white dots in the middle, one near the fore border, the second near the hind border and nearer the tip than the first; veins green: wings white, green towards the tips which are black; an oblique black spot on the fore-border near the tip; veins pale yellow (*Walker*). Body long, 10½; wings long, 29½ millims.

Reported from Assam: the Indian Museum possesses a specimen from Sikkim.

Genus NESIS, Stål.

Rio Jan. Hem. ii, p. 67 (1862): see p. 10.

17. NESIS TRICOLOR, Walker.

Eurybrachys tricolor, Walker, List Hom. B. M. ii, p. 384 (1851).
Nesis tricolor, Stål, R. J. Hem. ii, p. 67 (1862); Stettin Ent. Zeit. xxiv, p. 248 (1863).

♀. Sanguineous; head weakly olivaceous, frons margined fuscous at the base; tegmina blackish, weaker at the apex, variegated with confluent sordid stramineous-powdered spots; wings whitish. Differs from *N. sanguinipes*, Stål, in not having the tegmina distinctly narrowed towards the apex. Vertex a little longer in the middle than at the eyes, anteriorly broadly rounded: frons flat, aciculate: thorax bi-impressed in the middle: scutellum unicarinate: tegmina scarcely narrowed towards the apex, costal and commissural margins subparallel, obliquely broadly rounded at the apex, transverse veinlets rare, fine (*Stål*). Long, 9; exp. teg., 28 millims.

Reported from India.

18. NESIS (?) SANGUINIPES, Stål.

Aphæna sanguinipes, Stål, Ofvers. K. V.-A Förh. xi, p. 245 (1854).

Head, sordid yellow-testaceous; thorax and scutellum obscurely rufous-testaceous: tegmina black-fuscous with two indistinct bands and several posterior spots yellow farinose; beneath with feet sanguineous (*Stål*). Long, 8; broad, 4 millims.

Reported from India.

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Genus FRUTIS, Stål.

Ofvers. K. V.-A. Förh. p. 488 (1862) : see p. 11.

19. FRUTIS PULCHRA, Gray.

Lystra pulchra, Gray, Griffith's ed. An. King. Ins. ii, p. 260, t. 90, f. 5 (1832).
Aphæna pulchra, Walker, List Hom. B. M. ii, p. 278 (1851).
Aphæna veris-amor, Walker, J. Linn. Soc. Zool. i, p. 143 (1857).
Frutis pulchra, Stål, Ofvers. K. V.-A. Förh. p. 488, 500 (1862).

♂. Greenish-brown with the abdomen bright red, the tip clothed with a whitish cottony substance : tegmina green at the base, spotted with white opaque colour, with a transverse arched band of fulvous yellow ; tip pale yellowish-brown : wings covered with a white rosy matter with brown spots near the base and pale yellowish-brown at the apex : veins delicate (*Gray*). Black, face and legs ferruginous : abdomen red : tegmina narrow, intensely grass-green, with the costa, a basal spot, a few dots on the disc and an exterior curved transverse line, yellow ; tips tawny : underside with various marks of white tomentum which also appear on the costa above, at the base : wings snow-white with tawny tips (*A. veris-amor*, Walker). Body long, 23 ; exp. teg., 55 millims.

Reported from Borneo, India : the type of the genus, see Stål.

20. *Species of uncertain position.*

Eurybrachis reversa, Hope, Trans. Ent. Soc. xix, p. 134, t. 12, f. 8 (1845) ; *Eurybrachys id.*, Walker, List Hom. B. M. ii, p. 382 (1851).

Fuscous-yellow, head and thorax concolorous, abdomen whitish in the middle, adorned posteriorly with a yellow cottony substance ; apex shining white : tegmina fuscous-yellow, tinted subsanguineous at the base ; a round white spot at anterior margin, a second smaller almost on the middle of the disc and other very minute spots sprinkled about : basal half of wings whitish, apex irregularly irrorated fuscous : four anterior feet yellow-fuscous ; tibiæ more obscure ; last femora pale testaceous ; tibiæ blackish (*Hope*). Body long, 14½ ; exp. teg., 34 millims.

Reported from Silhat.

Subfam. DICTYOPHARINA, Stål.

Ofvers. K. V.-A. Förh. p. 744 (1870) : *Dictyopharida*, Stål, Hem. Afric. iv, p. 129, 149 (1866) : *Pseudopharides* pt., Am. & Serv., Hist. Nat. Ins. Hém. p. 502 (1843) : *Dyctiophoroides* pt., Spinola, A. S. E. F. (1 sér.) viii, p. 283 (1839).

Last tibiæ without a mobile spur at the apex : sides of frons not angulated ; feet very often simple ; anal area of wings never reticulate.

Clavus very rarely granulate, acuminate at apex, rarely somewhat obtusish, distinctly closed, two veins distant or very distant from the apex, sometimes, however, behind the middle of the clavus united in one; costa very rarely dilated: tegmina sometimes abbreviated or connate with clavus and corium. Claval vein not reaching the apex, united with the commissural margin near the apex: tegmina connate with clavus and corium, the lateral margins of the clypeus always carinate or acuminate: frons without an apical ocellus *(Stål)*.

Genus DICHOPTERA, Spinola.

A. S. E. F. (1 sér.) viii, p. 286 (1839); Stål, Hem. Afric. iv, p. 149 (1866).

Tegmina not or barely abbreviated, reaching at least the apex of the abdomen, very often extending beyond it: clavus distinct, furnished with one transverse vein between the interior vein and the claval suture: head narrower than the thorax: costa a little dilated, intramarginal: tegmina furnished with very numerous transverse veins towards the apex; feet longish: last pair of tibiæ multispinose, first pair longer than the femora (*Stål*).

21. DICHOPTERA HYALINATA, Fabricius.

Fulgora hyalinata, Fabr., Spec. Ins. ii, p. 315 (1781); Mant. Ins. ii, p. 261 (1787); Olivier, Enc. Méth. vi, p. 572 (1791): Fabr., Ent. Syst. iv, p. 5 (1794); Syst. Rhyng. p. 4 (1803); Donovan, Ins. India, t. 7, f. 3 (1800).

Fulgora hyalina, Gmelin, ed. Syst. Nat. i (4), p. 2091 (1782).

Flata hyalinata, Germar, Mag. Ent. iii, p. 190 (1818); Thon's Archiv. ii, (fasc. 2), p. 47 (1830).

Dyctiophora hyalinata, Germar, Silb. Rev. Ent. i, p. 175 (1834).

Pseudophana hyalinata, Burm., Handb. Ent. ii, (i), p. 160 (1835); Westwood, Trans. Linn. Soc. xviii, p. 150 (1841).

Dichoptera hyalinata, Spinola, A. S. E. F. (1 sér.) viii, p. 289, t. 13, f. 3 (1839); Am. & Serv., Hist. Nat. Ins. Hém. p. 504 (1843); Walker, List Hom. B. M. ii, p. 303 (1851).

Frons produced, short, conical, above inequal, beneath furrowed, pallid, with black dots and streaks: eyes large, globose, white: thorax pallid, irrorated black: scutellum more obscure: tegmina hyaline, veins punctured white and black and with a black streak in the middle: wings hyaline with a dull black spot on the apex (*Fabricius*). Body long, 19½; exp. teg., 50 millims.

Reported from Bengal: the Indian Museum possesses specimens from Bangalore, Calcutta, India.

Genus METAURUS, Stål.

Hem. Afric. iv, p. 151 (1866).

Head not or but very slightly callous behind the eyes, this callous part seen from the side forming a narrow margin behind the eyes, the cephalic process short and slender; vertex, the disc of the thorax, and scutellum lying in the same plane; frons and clypeus long, the former tricarinate, the latter unicarinate in the middle; second joint of the antennæ short, subglobose; rostrum extending beyond the apex of the last coxæ: thorax carinate in the middle: apical two-thirds of the tegmina very densely reticulated, costa very slightly dilated; the two claval veins united behind the middle: feet long, slender; first pair of coxæ, oblong, scarcely reaching the apex of the clypeus; first femora scarcely dilated beneath, armed with a small minute tooth near the apex; tibiæ simple, longer than the first femora, last pair 6-spined (*Stål*).

22. METAURUS RETICULATUS, Stål.

Metaurus reticulatus, Stål, Berlin Ent. Zeitschr. x, p. 391 (1866).

♀. Pale yellow-virescent: tegmina pale yellow-greenish-hyaline, veins greenish; wings somewhat colourless: the small tubercle placed on the genæ before the upper part of the eyes and a small anterior spot on the sides of the thorax behind the eyes, black and shining: cephalic process short, slender, twice as long as the thorax, turning upwards; frons oblong, very slightly roundly amplified towards the apex, narrowed above the middle: thorax with a somewhat indistinct ridge: scutellum slightly tricarinate: tegmina gradually somewhat amplified towards the apex; stigma with eight veins (*Stål*). Long, 11; exp. teg., 32 millims.

Reported from Cambodia.

Genus ANAGNIA, Stål.

Stettin Ent. Zeit. xxii, p. 149 (1861); Hem. Afric. IV, p. 151 (1866).

Head prominent before the eyes; frons elongate, tricarinate; clypeus marginate, carinate in the middle: pronotum carinate in the middle, posteriorly angularly-emarginate, anteriorly behind the head, obtusely angularly-prominent: tegmina extending much beyond the abdomen, longitudinal veins on corium forked and united with some few transverse veinlets towards the apex: feet rather long, slender, first pair of femora dilated beneath, last pair of tibiæ multispinose: allied to *Dictyophara* (Stål).

23. ANAGNIA SPLENDENS, Germar.

Flata splendens, Germar in Thon's Archiv. ii, fasc. 2, p. 48 (1830) : Walker, List Hom. B. M. ii, p. 310 (1851).

Pseudophana splendens, Westwood, Trans. Linn. Soc. xviii, p. 151 (1841).

Dictyophora indiana, Walker, l. c. p. 310 (1851).

Anagnia splendens, Stål, Stettin Ent. Zeit. xxii, p. 149 (1861.)

♂, ♀. Greyish-flavescent, sprinkled fuscous; a stigmatic spot on the tegmina and interior streak behind the middle, a small subapical streak on the wings, fuscous; anterior tibiæ ringed black, last pair with spine black *(Stål)*. Long, 7—9½; exp. teg., 20—25 millims.

Reported from Manilla, Java, Bombay, India.

Genus CENTROMERIA, Stål.

Ofvers. K. V.-A. Förh. p. 745 (1870).

Body somewhat elongate: head produced, ascending more or less before the eyes, gradually narrowed: vertex somewhat equal in breadth to the eyes, gradually acuminated before the eyes; frons tricarinate, the median ridge running through it very distinct, lateral ridges extended through half of the upper frons, less elevated; a distinct ridge running through the clypeus: thorax unicarinate, posteriorly broadly angularly sinuated: scutellum tricarinate: tegmina gradually amplified towards the apex, apical part furnished with numerous transverse veins; the veins of the clavus united behind the middle; interior ulnar vein forked at almost the same distance from the base and from the united claval veins; radial vein forked a little behind the middle of the tegmen; stigma elongate or oblong, with some veins: feet long, slender; first pair of femora beneath near the apex with a very minute, acute spinule. Near to *Dictyophara*, Germar, the feet are longer and more slender and the first pair of femora spined *(Stål)*.

24. CENTROMERIA SPEILINEA, Walker.

Dictyophora speilinea, Walker, J. Linn. Soc. Zool. i, p. 84 (1856).

Green: head, three ridges on the pronotum (the lateral pair marginal) and three on the mesonotum also its sides in part, emerald-green: head with three ridges above and one beneath and two ridges on pronotum near the lateral emerald-green ridges, luteous: cephalic protuberance lanceolate, ascending, as long as the hind part of the head: fore tibiæ and tarsi, tawny: tegmina and wings limpid, veins and stigma green, the latter occupying three areolas *(Walker)*. Body long, 10½: exp. teg., 29½ millims.

Reported from Singapore.

Genus DICTYOPHARA, Germar.

Dictyophora, Germar, Silb. Rev. Ent. i, p. 165 (1833) : Walker, List Hom. B. M. ii, p. 307 (1851).

Dyctiophora Spinola, A. S. E. F. (1 sér.) viii, p. 290 (1839) : *Pseudophana*, Burm., Handb. Ent. ii (i) p. 159 (1835) ; Am. & Serv., Hist. Nat. Ins. Hém. p. 506 (1843) : *Chanithus*, Amyot, A. S. E. F. (2 sér.) v, p. 160 (1847) ; Kolenati, Mel. Ent. vii, p. 29 (1857) : *Nersia*, Stål, Rio Jan. Hem. ii, p. 62 (1861) : *Dictyophara*, Stål, Hem. Afric. iv, p. 154 (1866) : Fieber, Rev. Mag. Zool. (3 sér.) iii, p. 357 (1875).

Body oblong or oval, a little depressed : head not or only very slightly callous behind the eyes, varying very much in form, abruptly truncated before the eyes or more or less to a distance protuberant, the protuberance straight or recurved : vertex and frons very often carinated : clypeus long, carinated in the middle : second joint of antennæ small, subglobose : rostrum long : thorax very often broadly emarginated at the base, slightly sinuated anteriorly behind the eyes, touching the entire posterior margin of the head, furnished with 1—3 ridges : scutellum very often tricarinated. Tegmina very often extending beyond the apex of the abdomen, third part or barely apical half furnished with transverse veins ; clavus without a transverse vein : feet moderate or longish, slender, simple ; first pair of femora unarmed, shorter than the tibiæ, last pair of tibiæ 4—6-spinose : exterior radial and ulnar veins contiguous at the base (*Stål*).

25. DICTYOPHARA LINEATA, Donovan.

Fulgora lineata, Donovan, Ins. India, t. 8, f. 1 (1800) ; Westwood, Trans. Linn. Soc. xviii, p. 147 (1841).

Fulgora pallida, G. Gray, Griffith, An. King., Ins. i, p. 260, t. 90, f. 2 (1832).

Dictyophora lineata, Walker, Cat. Hom. B. M. ii, p. 310 (1851).

Cephalic process linear, ascending ; tegmina pale with two brown lines (*Donovan*). Pale testaceous or fulvous-whitish : cephalic process as long as half the body, ascending, pale greyish-luteous, slender, a little thickened at the apex : tegmina narrow, elongate, whitish, with blackish dots arranged in lines towards the internal and external margin of the posterior part of the tegmina, also a narrow black line towards the base of the costa : cephalic process and feet, punctured black : last femora at the apex and the tarsi broad (*Westw.*) Body long with cephalic process (wings closed), 12½ millims.

Reported from Bengal. In Donovan's figure, the black spots on the tegmina appear to be confluent forming two lines and extending throughout the entire length of the tegmina : the Indian Museum possesses a specimen from Sibságar (Assam).

26. DICTYOPHARA PALLIDA, Donovan.

Fulgora pallida, Donovan, Ins. India, t. 8 f. 2 (1800).
Pseudophana pallida, Westwood, Trans. Linn. Soc. xviii, p. 150 (1841).
Dictyophora pallida, Walker, Cat. Hom. B. M. ii, p. 310 (1851): nec *D. pallida*, Walker, l. c. p. 320.

Cephalic process linear, ascending: thorax pale green, with red lineations; tegmina hyaline (*Donovan*). Size of preceding, but easily recognized by the longitudinal red lines on pronotum and prostethium. Body long with cephalic process, $12\frac{1}{2}$; to end of closed tegmina, $19\frac{1}{2}$ millims.

Reported from Bengal: the Indian Museum possesses specimens from Ràniganj (Lower Bengal).

27. DICTYOPHARA GRAMINEA, Fabricius.

Fulgora graminea, Frabricius, Syst. Rhyng. p. 4 (1803).
Flata graminea, Germar in Thon's Archiv. ii. fasc. 2, p. 47 (1830).
Pseudophana graminea, Burm., Handb. Ent. ii (2) p. 160 (1835); Westwood, Trans. Linn. Soc. xviii, p. 150 (1841).
Dictyophora graminea, Walker, List. Hom. B. M. ii, p. 309 (1851).

Cephalic process porrect, bicarinate broadly above: tegmina and body green, immaculate (*Fabr.*).

Reported from India.

28. DICTYOPHARA DESPECTA, Walker.

Dictyophora despecta, Walker, List. Hom. B. M. ii, p. 314 (1851).

♂. Body tawny: head quite four times longer than the pronotum; the cephalic protuberance continued in a line with the pronotum, almost prismatic, slightly tapering from the base to the tip which is rather obtuse: angles green: pronotum slightly conical in front, much sinuated on the hind border, adorned with five bright green stripes; a slight oblique ridge on each side: mesonotum with three bright green stripes and a green spot on each side: abdomen obconical, a little longer than the thorax: legs pale tawny, slender, slightly grooved; hind tibiæ armed with four black-tipped spines: wings colourless, a slight tawny tinge on the tegmina; stigma tawny, occupying parts of 2—3 areolas: veins brown, tawny towards the base (*Walker*). Body long, $10\frac{1}{2}$; teg., $16\frac{1}{2}$ millims.

Reported from Malabar coast.

29. DICTYOPHARA SINICA, Walker.

Dictyophora sinica, Walker, List. Hom. B. M. ii, p. 321 (1851); Stål, Ofvers. K. V. A. Förh. p. 487 (1862). China.
Dictyophora inscripta, Walker, l. c., p. 322 (1851). Hong Kong.
Dictyophora insculpta, Walker, l. c., Suppt. p. 67 (1858). N. China.

Body pale luteous, almost fusiform: head above with a short green stripe which does not extend beyond the vertex, the lateral edges of which are also green; beneath bright luteous with a pale green border, the median ridge extending to the clypeus, bright green; clypeus tawny, striped with brown towards the tip: rostrum pale tawny: pronotum striped green; mesonotum with three indistinct green stripes: abdomen green, a brown stripe on the disc, pale tawny at the tip: legs pale tawny, partly striped with brown; hind tibiæ with four black-tipped spines: tegmina and wings colourless, the tips of the former pale yellowish-brown; stigma brown occupying three areolas; veins green, brown towards the tips (*Walker*). Body long, 9½; teg., 16¾ millims.

Reported from China: Assam (?).

30. DICTYOPHARA (?) NIGRIMACULA, Walker.

Dictyophora nigrimacula, Walker, List. Hom. B. M. ii, p. 318 (1851).

♂. Body fusiform: head as long as the thorax tapering slightly to the tip which is obtuse, slightly elevated; cephalic protuberance transversely striated above and on each side; upper side ferruginous; vertex with a median stripe, yellow, and lateral stripes, green, which last are continued along near half the length to the tip; a black median stripe extends from the vertex to the tips towards which it occupies the whole disc; sides black with tawny borders: under-side bright orange red, having on each side a tawny brown-spotted stripe which in its course becomes bright green and is continued along the clypeus; the bright green middle-ridge also extends along the whole length and is pale yellow at each end; the under side slightly widens along the whole length from the tip to the clypeus, with the exception of a slight contraction between the eyes: clypeus reddish at its base, brown with yellow stripes towards its tip: rostrum tawny with a black tip, reaching the hind coxæ: pronotum ferruginous, slightly widened and almost angular in front, slightly sinuated along the posterior margin, with five bright green ridges: the inner pair a little oblique, the outer pair more oblique and parallel to the sides which are green; the space beneath on each side of the eyes is pyriform, red, with a green border and a bright green median stripe: mesonotum black along the anterior margin, with three bright green slightly interrupted stripes; on each side near the base of the tegmen is a bright green spot; beneath black with a few yellow stripes and a ferruginous border: abdomen black, obconical, a little longer than the thorax with five rows of greenish-tawny spots, those of the middle row are slender and form a slightly interrupted stripe, the others are irregular and much emarginated: legs tawny, slightly grooved, striped black, feet black towards the tips, posterior tibiæ armed with five black-tipped spines; hind-feet much dilated: tegmina and wings colourless, tips of the former brown, stigma very dark occupying 3—4 areolets, veins black, greenish-tawny at the base *(Walker)*. Body long, 10½; teg., 21 millims.

Reported from N. India.

31. DICTYOPHARA (?) ALBIVITTA, Walker.

Dictyophora albivitta, Walker, List. Hom. B. M. ii, p. 319 (1851).

♂. Body tawny, fusiform: head above with three green stripes, median more distinct; beneath with a bright green ridge and on each side a pale green stripe, the three continued throughout the whole length and through a part of the clypeus: rostrum tawny, tip black, extending a little beyond the intermediate coxæ: pronotum anteriorly rounded, not conical, slightly sinuated along the hind border which like the sides is green: disc with five bright green stripes, inner pair curved, slightly oblique, outer pair more oblique, parallel to the sides; plates beneath, pyriform, bordered with green and with a green stripe: mesonotum with three green stripes and a green spot on each side: abdomen grass-green, obconical, mottled yellow, tawny at the tip with three parallel indistinct whitish stripes: legs pale tawny, partly green, slightly grooved; femora and anterior tibiæ striped brown, posterior tibiæ armed with five black-tipped spines; posterior feet much dilated: tegmina and wings colourless, the former slightly tawny at the tip; stigma tawny occupying two areolets and part of a third; veins pale greenish-tawny, darker towards the tips *(Walker)*. Body long, 10½; teg., 21 millims.

Reported from N. Bengal.

32. DICTYOPHARA WALKERI, n. sp.

Dictyophora pallida, Walker, List B. M. ii, p. 320 (1851); nec Donovan.

♂. Body fusiform, pale luteous: tip of vertex, black: head above with a bright green stripe along each edge and with a short green median stripe which does not extend beyond the eyes; sides green; beneath bright luteous with three bright green ridges which are continued along part of the clypeus: rostrum tawny, tip black, reaching nearly to the last coxæ: pronotum hardly conical in front, slightly sinuate posteriorly, bordered with green, with five bright green stripes, side plates pyriform with green margins and a bright green median stripe: mesonotum with three and the sides with two green stripes: abdomen obconical, a little longer than the thorax, yellow with whitish stripes, luteous towards the base, tawny at the tip: posterior margins of the segments grass-green: legs slender, slightly grooved, dull pale yellow, tinged with green; tips of the feet and of the fore tibiæ, brown; hind tibiæ armed with four black-tipped spines; hind feet moderately broad: tegmina and wings colourless, a slight tawny tinge on the tips of the tegmina, stigma pale brown, occupying two areolets and part of a third; veins green, brown towards the tips (*Walker*). Body long, 7¼; teg., 14¾ millims.

Reported from N. India.

33. Dictyophara leptorhina, Walker.

Dictyophora leptorhina, Walker, List Hom. B. M. ii, p. 321 (1851).

♂. Body tawny, fusiform: cephalic prolongation with the four sides of equal breadth with green edges, a green stripe above, distinct only on the vertex, that beneath appearing along the whole length to the clypeus which is brown: rostrum tawny, tip black, reaching the hind coxæ: pronotum rounded in front, more slightly sinuate behind, with green ridges which also appear on the mesonotum: abdomen green, obconical, slightly luteous towards the base, longer than the thorax: legs pale tawny, slightly grooved; femora striped black; hind tibiæ armed with five black-tipped spines; hind feet much dilated: tegmina and wings colourless; stigma brown, colouring the borders but not the discs of three areolas; veins of the tegmina brown, green towards the base; veins of wings, black (*Walker*). Body long, 9½; teg., 19 millims.

Reported from Java: with the thorax luteous, from India.

34. Dictyophara sauropsis, Walker.

Dictyophora sauropsis, Walker, Journ. Ent. i, p. 306 (1862).

♂. Tawny: head forming a long, quadrilateral, slightly tapering cone, which has a rim on both sides, above and beneath; underside reddish ochraceous, with three other pale ridges: pronotum arched, more than four times as broad as long, with a median ridge: mesonotum bicarinate: tegmina and wings cinereous hyaline; veins black, pale tawny towards the base; transverse veinlets incrassated: tegmina with an elongated black stigma (*Walker*). Body long, 10½; teg., 21 millims.

Reported from Dacca (Bengal).

35. Dictyophara patruelis, Stål.

Pseudophana patruelis, Stål, Freg. Eug. Res. Ins. p. 271 (1859).
Dictyophara patruelis, Stål, Rio Jan. Hem. ii, p. 63 (1862).

♂. Weakly miniaceous: vertex, abdomen, and feet sordid weak flavescent: frons, clypeus, thorax, scutellum, and pectus with grass-green ridges: tegmina vitreous, veins and stigma fuscous: head as long as the thorax and scutellum taken together. Close to *D. sobrina*, Stål, but smaller and head shorter: head testaceous-flavescent; vertex with a longitudinal ridge between the eyes; frons, clypeus, and thorax miniaceous, the two former with ridges, the last with a median ridge, an oblique line on both sides and a lateral ridge and the lateral margins, grass-green: scutellum weakly miniaceous, with three parallel ridges and a posterior spot on each side, grass-green: tegmina almost twice as long as the abdomen, sordid vitreous, the third apical part transversely veined; veins and stigma fuscous: pectus weakly miniaceous with a grass-green ridge on both sides: abdomen and feet weak sordid virescent-flavescent, the disc of the abdomen and the apices and lines on the feet, black-fuscous (*Stål*). Body long, 8; broad, 2¼ millims.

Reported from Malacca.

Subfam. CIXIINA, Stål.

Cixiida, Stål, Hem. Afric. IV, p. 129, 164 (1866)! *Cixiina*, Ofvers. K. V.-A. Förh. p. 746 (1870).

Similar to *Dictyopharina* except that there are usually three ocelli, one of which is placed on the apex of the frons: this frontal ocellus is very rarely wanting and if wanting the sides of the clypeus are convex and ecarinate (*Stål*).

Genus CIXIUS, Latreille, Stål.

Gen. Ins. iii, p. 166 (1807); Guérin, Voy. Bélanger Ind. Orient. Zool. p. 463 (1834); Burm., Handb. ii (i) p. 156 (1835): Stål, Hem. Afric. iv, p. 164, 169 (1866): Fieber, Rev. Mag. Zool. (3 sér.) iii, p. 355 (1875).

Head somewhat narrower than the thorax, short, roundly sinuated at the base; vertex somewhat concavish; frons and clypeus together elliptical, furnished with a median ridge running through them; frons with an ocellus on the apex, sides of clypeus carinated: eyes slightly or only very slightly sinuated beneath: antennæ inserted beneath the eyes, very short, first joint concealed, second small, subglobose: thorax very short, posteriorly, deeply, angularly emarginated: scutellum tricarinate lateral margins of tegmina parallel, interior ulnar vein and the radial vein forked at a distance from the base: feet moderate, simple, last tibiæ armed with 2—3 spines (*Stål*).

36. CIXIUS (?) ALBISTRIGA, Walker.

Cixius albistriga, Walker, J. Linn. Soc. Zool. i, p. 87 (1856).

Blackish, testaceous beneath: head much smaller and frons narrower than in European species; frons dark brown: posterior margins of abdominal segments reddish above, whitish beneath: tegmina brown with three whitish transverse streaks towards the tip of the costa : wings grey (*Walker*). Body long, 4¼ ; teg., 10½ millims.

Reported from Singapore : a specimen doubtfully assigned to this species has been received from Burma, but is probably a *Brixia*.

37. CIXIUS (?) CAUDATUS, Walker.

Cixius caudatus, Walker, Ins. Saund. Hom. p. 43 (1858).

Tawny : vertex depressed, longer than broad, its borders elevated ; frons and face forming a fusiform compartment with a median ridge : pronotum arched, very narrow in the middle ; mesonotum 5-carinate, the external pair of ridges angulate, a brown stripe interlined with tawny on each side : oviduct extending far beyond the abdomen, sheaths brown : legs testaceous : tegmina with a brown stigma, veins testaceous with black dots, some black streaks also on the disc before the middle and the transverse veinlets and some parts of the exterior veins clouded with brown : wings with black veins (*Walker*). Body long, 4¼ ; teg., 12½ millims.

Reported from India.

38. CIXIUS (?) EFFERATUS, Walker.

Cixius efferatus, Walker, J. Linn. S. Zool. i, p. 87 (1856).

Testaceous : frons subfusiform, attenuated in front : eyes large nearly contiguous on the vertex : abdomen tawny : tegmina and wings limpid ; veins tawny ; stigma testaceous, with a brown spot close to its tip and opposite a smaller and paler brown spot on the interior border : wings with a brown streak at the tip of the costa (*Walker*). Body long, 5¼ ; exp. teg., 12½ millims.

Reported from Singapore.

Genus OLIARUS, Stål.

Berlin Ent. Zeitschr. vi, p. 306 (1862) ; Hem. Afric. iv, p. 164, 166 (1866) ; Hem. Fabr. ii, p. 92 (1868) : Fieber, Rev. Mag. Zool. (3 ser.) iii, p. 356 (1875).

Head somewhat narrower than the thorax, angularly emarginate at the base ; vertex varying in length and breadth, concave ; frons and clypeus together elliptical, furnished with a distinct, median, longitudinal ridge running through them, lateral margins rounded, slightly dilated ; frons with an ocellus on the apex ; sides of clypeus ridged : eyes scarcely or but slightly sinuated beneath : antennæ very short, inserted beneath the eyes, first joint hidden, second somewhat globose, small : thorax very short, posteriorly deeply angularly sinuated : scutellum with five ridges : tegmina rounded at the apex ; radial and exterior ulnar vein contiguous at the base itself, radial and interior ulnar vein forked at a more or less distance before the middle of the tegmina : feet moderate, single ; last pair of tibiæ, 2—3-spinose (*Stål*).

39. OLIARUS WALKERI, Stål.

Cixius walkeri, Stål, Freg. Eug. Resa. Hem., p. 272 (1859).
Oliarus walkeri, Stål, Berlin Ent. Zeitschr. vi, p. 306 (1862).

♂. Obscurely testaceous ; frons and feet testaceous-yellow : tegmina weak vinaceous-hyaline ; veins concolorous, remotely punctured fuscous behind the middle ; the five apical transverse veins clothed fuscous; stigma weak testaceous-yellow, inwardly narrowly fuscous : head yellow-testaceous ; vertex almost twice as long as broad with two ridges running forwards from the middle, converging ; frons with the oval clypeus narrowed at base and apex, a single forked ridge at the base itself : thorax very short, posteriorly angularly-sinuated, testaceous, with five ridges of a lighter colour of which the lateral pair diverge somewhat towards the apex : tegmina with the veins concolorous, fuscous at the apex ; beneath with feet pale testaceous-flavescent ; pectus black-fuscous (*Stål*). Long, 4 ; broad, $1\frac{1}{2}$ millims.

Reported from Malacca, Manilla.

40. OLIARUS BOHEMANI, Stål.

Cixius bohemani, Stål, Freg. Eug. Resa. Hem., p. 272 (1859).
Oliarus bohemani, Stål, Berlin Ent. Zeitschr. p. 306 (1862).

♂, ♀. Blackish : ridges on the head, incisures on abdomen and the tibiæ, pale testaceous-yellow, tegmina weak vinaceous hyaline, veins remotely punctured fuscous. Head blackish ; vertex longer by half than broad with a less elevated longitudinal ridge and another transverse arched one behind the apex ; frons and the oval clypeus with a single longitudinal ridge, forked at the base itself : thorax very short, testaceous yellow, posteriorly angularly-sinuated : scutellum blackish, somewhat parallel, with five ridges, of which the lateral pair converge somewhat at the base and apex : the tegmina twice as long as the abdomen, very weak fuscescent hyaline towards the apex ; veins remotely punctured, fuscous at the apex ; clavus with a median dot and obliquely behind it a dot also on the corium, fuscous : beneath black-fuscous : feet pale testaceous yellow, femora fuscous-testaceous (*Stål*). Long, $3\frac{1}{2}$; broad, $1\frac{1}{3}$ millims.

Reported from Hong-Kong.

Genus BRIXIA, Stål.

Ofvers. K. V.-A. Förh. xiii, p. 162 (1856) ; Freg. Eug. Resa, p. 276 (1859) ; Hem. Afric. iv, p. 166, 173 (1866) : includes *Triopsis*, Sign., A. S. E. F. (3 sér.), viii, p. 187 (1860).

Head much narrower than the thorax; vertex narrow, compressed, narrower by half than the eyes, passing over into the frons which is long, gradually narrowed upwards, much compressed between the eyes, without a ridge, furnished with an ocellus at the apex; median ridge of clypeus less distinct, lateral margins carinated: eyes beneath sinuated: antennæ inserted beneath the eyes, first joint exserted, second longer than thick: thorax very short, angularly emarginated at the base: scutellum tricarinate: tegmina gradually somewhat amplified towards the apex; radial and exterior ulnar vein united near the base: feet moderate, simple; last tibiæ unarmed (*Stål*).

41. Brixia meander, Walker.

Cixius meander, Walker, List Hom. B. M. ii, p. 349 (1851).
Brixia meander, Stål, Ofvers. K. V.-A. Förh. p. 487 (1862).

Body tawny: frons long and narrow with a row of brown spots along each side of the disc which is also brown: rostrum tawny: eyes large: pronotum on both sides obliquely tricarinate: disc of the mesonotum brown: legs tawny, slightly sulcated: each femur with two brown rings: tegmina almost colourless, adorned with several waved brown bands which are partly confluent or interrupted, discs of the spaces between them occupied by paler brown bands: a large yellow spot on the anterior margin: veins pale stramineous, thickly dotted with black knots (*Walker*). Body long, 4¼; teg., 10½ millims.

Reported from India.

Genus Benna, Walker.

J. Linn. Soc. Zool. i, p. 90 (185[illegible]): Stål, Hem. Afric. iv, p. 166 (1866).

Body rather slender, head a little narrower than the thorax with a ridge which extends from the back of the vertex to the rostrum; sides also ridged; frons compressed, elongate-subfusiform: 1—2 joints antennæ a little shorter together than the breadth of the front; filament not long: thorax tricarinate, pronotum very short: abdomen at the base with two lateral capitate appendages like the halteres of *Diptera*, tip terminating in a long, curved oviduct: legs rather long and slender: tegmina and wings broad, rounded at the tips, the former with about twenty areolets, the discal generally shorter than the basal and marginal. (*Walker*.)

Frons with a longitudinal ridge narrowed upwards, scarcely distinguishable from the vertex: first joint of the antennæ prominulous, second longer than broad: abdomen furnished on both sides at the base with a long, filiform, clavate process: tegmina gradually amplified from the base towards the apex; the costal margin slightly sinuated towards the base; the radial and ulnar veins separately emitted from the ulnar trunk or somewhat contiguous at the base itself (*Stål*).

42. BENNA CAPITULATA, Walker.

Benna capitulata, Walker, J. Linn. Soc. Zool. i, p. 90, t. 3, f. 9, (1856).

♀. Testaceous: abdomen with long cottony secretions; capitate appendages with white tips: tegmina and wings hyaline, the former with a very slight testaceous tinge; veins brown, testaceous towards the base and in the front, with a black basal dot and two smaller brown dots near the base: the transverse veinlets partly clouded brown, a brown streak along the exterior border; stigma testaceous (*Walker*). Body long, 6¼; teg. 16½ millims.

Reported from Singapore.

Subfam. DELPHACINA, Stål.

Delphacida, Stål, Hem. Afric. iv, pp. 131, 175 (1866); *Delphacina*, Ofvers. K. V.-A. Förh., p. 747 (1870).

Distinguished by having the last pair of tibiæ furnished with a mobile spur (*Stål*).

Genus HYGYOPS, Guérin.

Ugyops, Guérin, Voy. Bél. Ind. Orient. p. 477 (1843); Spinola, A. S. E. F. viii, p. 321 (1839); Walker, List Hem. B. M. ii, p. 338 (1851): *Hygyops*, Stål, Hem. Afric. iv, p. 175 (1866): includes *Bidis*, Walker, J. Linn., Soc. Zool. i, p. 88 (1856): *Hygiops*, Am. & Serv., Hist. Nat. Ins. Hém. p. 511 (1843).

Antennæ inserted below the eyes, almost as long as the body; two first joints equal, cylindrical, with the filament inserted at the tip of the second joint, which is granulate; eyes very slightly emarginate beneath; apparently no ocelli: frons narrow, a little ascending, anteriorly much longer than broad, a little dilated in the middle, longitudinally grooved: rostrum as long as the head, covered at its base by a pointed, oblong labrum: pronotum narrower than the mesonotum, a little emarginate posteriorly: mesonotum triangular, apex pointing behind: tegmina narrower than the wings, oblong: abdomen flattered, feet long, spinose (*Guérin*).

43. HYGYOPS-PERCHERONII, Guérin.

Ugyops percheronii, Guérin, Voy. Bél. Ind. Orient. p. 478 (1834); Icon. Règne Anim., t. 58, f. 16 (1830-34); Burm., Handb. Ent. ii (i), p. 152 (1835); Spinola, A. S. E. F. viii, p. 323 (1839); Walker, List Hom. B. M. ii, p. 338 (1851).
Hygiops percheronii, Am. & Serv., Hist. Nat. Ins. Hém. p. 512 (1843).

Ferruginous red, antennæ of the same colour, brown at the tip: tegmina and wings transparent, veins reddish: beneath and feet ferruginous (*Guérin*). Body long, 5; exp. teg., 16 millims.

Reported from Cochin China.

44. HYGYOPS NOTIVENA, Walker.

Bidis notivena, Walker, J. Linn. Soc. Zool. i, p. 88 (1856).
Hygyops notivena, Stål, Hem. Afric. iv, p. 175 (1866).

♂, ♀. Testaceous, partly green : tegmina and wings transparent, the former with a very slight testaceous tinge ; veins testaceous, here and there blackish : the ♂ partly red (*Walker*). Body long, $4\frac{1}{4}$; teg., $12\frac{1}{2}$ millims.

Reported from Singapore, Malacca.

Subfam. ACHILINA, Stål.

Achilida, Stål, Hem. Afric. iv, pp. 130, 181 (1866) ; *Achilina*, Stål, Ofvers. K. V.-A. Förh., p. 748 (1870).

Head narrower than the thorax ; sides of the clypeus carinate : last joint of rostrum elongate : thorax angularly emarginate at the base : tegmina amplified inwards behind the clavus which is very rarely granulated, acute at the apex, distinctly closed ; the claval vein continued to the apex itself or united with the claval suture near the apex : last pair of tarsi with the first joint elongate.

Genus FAVENTIA, Stål.

Hem. Afric. iv, p. 181 (1866) ; Ofvers. K. V.-A. Förh., p. 748 (1870).

Head narrower than the thorax ; frons with a long and clypeus with a distinct ridge running through it, the lateral ridges on the clypeus not united at the apex : thorax very short, angularly emarginate at the base : scutellum tricarinate : tegmina roundly truncated at the apex ; the interior ulnar and the radial vein forked before the middle : first tibiæ longer than the femora and trochanters taken together, the last pair unispinose (*Stål*). Type, *C. pustulatus*, Walker.

45. FAVENTIA PUSTULATA, Walker.

Cixius pustulatus, Walker, J. Linn. Soc. Zool. i, p. 87 (1856).
Faventia pustulata, Stål, Berlin Ent. Zeitschr. x, p. 392 (1866).

Tawny, testaceous beneath : head greenish, with a black dot on each side, ridges ferruginous : tegmina with some paler marks and with many minute blackish dots which are accompanied by 2—3 larger and darker dots : wings brown (*Walker*). Body long, $6\frac{1}{4}$; teg., $14\frac{1}{2}$ millims.

Reported from Singapore.

Genus HELICOPTERA, Amyot & Serville.

Hist. Nat. Ins. Hém. p. 526 (1843) ; Stål, Hem. Afric, iv, pp. 181, 184 (1866) : includes *Elidiptera*, Spin., A. S. E. F. viii, p. 504 (1839) ; Walker, List Hom. B. M. ii, p. 328 (1851).

Body depressed: head much narrower than the thorax, produced before the eyes; vertex posteriorly about twice as broad as the eyes, somewhat concave, not ridged; frons much longer than broad, distinctly narrowed upwards, more or less distinctly ridged in the middle; sides of clypeus ridged: eyes rounded, obsoletely sinuated beneath: second joint of the antennæ somewhat globose: thorax tricarinate, lateral ridges not reaching the base: scutellum tricarinate: tegmina rounded at the apex; the radial and exterior ulnar veins united at the base; radial and exterior ulnar vein forked rather far from the base: feet moderate, first tibiæ subequal in length to the femora and trochanters taken together; last tibiæ unispinose (*Stål*).

46. HELICOPTERA? SMARAGDILINEA, Walker.

Elidiptera smaragdilinea, Walker, J. Linn. Soc. Zool. i, p. 86 (1856).

Ferruginous: head about the eyes and on each side of the frons, a spot in the middle of the pronotum and one on each side and a stripe on the mesonotum, emerald-green: cephalic protuberance, slender, cylindrical ascending, black above, green beneath, about twice the length of the head above; frons long and narrow; face and pectus black and white: abdomen with a green stripe on each side and a black stripe on each side beneath: legs tawny, femora black at the base; tibiæ and tarsi partly green; fore tibiæ white towards the tips: tegmina and wings limpid, the former with a narrow brown streak along the terminal part of the costa, and with a broad brown streak along the corresponding part of the hind border, the two streaks connected by a brown streak along the transverse veinlets (*Walker*). Body long, 9½: teg., 23 millims.

Reported from Mount Ophir, Singapore.

Subfam. TROPIDUCHINA, Stål.

Tropiduchida, Stål, Hem. Afric. iv, p. 130, 186 (1866): *Tropiduchina*, Ofvers. K. V.-A. Förh., p. 748 (1870).

Head narrower than the thorax; sides of clypeus without a ridge or with an obtuse ridge: thorax very often angularly emarginate at the base, very rarely roundly sinuate, tricarinate; lateral ridges diverging, very often reaching the base; commisural margin of tegmina straight or rounded behind the clavus which is generally as in *Achilina;* costa sometimes dilated, costal membrane transversely veined; first joint of last tarsi elongate (*Stål*).

Genus DARADAX, Walker.

J. Linn. Soc. Zool. i, p. 85 (1856) ; Stål, Hem. Afric. iv, p. 188 (1866).

Head lanceolate, ascending, carinate on both sides ; frons lanceolate, with a median and lateral ridges : antennæ globose, very minute, setiform filament moderately long, very slender : pronotum much arched with a slight median ridge, each side forming a fusiform compartment : mesonotum quadricarinate : tegmina fusiform, with numerous parallel equidistant veinlets along the costa ; ulnar areas long ; apical areas short, like those of the costa (*Walker*).

47. DARADAX FUSIPENNIS, Walker.

Daradax fusipennis, Walker, J. Linn. Soc. Zool. i, p. 86 (1856).

Green, partly lutescent : tegmina with brown dots along the exterior margin : wings white (*Walker*.) Body long, $6\frac{1}{4}$; teg., $14\frac{1}{2}$ millims.

Reported from Malacca.

Genus TROPIDUCHUS, Stål.

Ofvers. K. V.-A. Förh. p. 248 (1854) ; Hem. Afric. iv, p. 188 (1866) : includes *Euria*, Walker, J. Linn. Soc. Zool. i, p. 87 (1856).

Body oblong : head somewhat narrower than the thorax, slightly prominulous before the eyes, obtuse : vertex arcuate, transverse, much broader than the eyes, deeply sinuated at the base, rounded at the apex ; frons much longer than broad, somewhat narrowed upwards, with 1 or 3 ridges ; clypeus with a median ridge, sides convex or obtusely ridged : rostrum somewhat short : second joint of the antennæ small, subglobose : thorax short, angularly emarginate at the base, tricarinate on the disc : scutellum tricarinate : tegmina not or but slightly narrowed towards the apex ; costa remote from the margin, emitting outwards numerous transverse veins, radial and ulnar veins forked rather distant before the middle and at an equal length from the base ; apical part with two rows of transverse veins : feet moderate ; first tibiæ somewhat longer than the femora and trochanters taken together, last tibiæ trispinose (*Stål*).

48. TROPIDUCHUS LURIDUS, Walker.

Euria lurida, Walker, J. Linn. Soc. Zool. i, p. 88 (1856).

Brownish, paler beneath : head green with tawny ridges : tegmina and wings lurid, the former with four brown bands of which the first and second are dilated in front, the third is slender, curved, joined at each end to the second, the fourth is marginal : wings with three brown bands (*Walker*.) Body long, $5\frac{1}{4}$; teg., $14\frac{1}{2}$ millims.

Reported from Singapore.

Genus ELICA, Walker.

J. Linn. Soc. Zool. i, p. 86 (1856).

Head conical, slightly ascending, tricarinate above: frons lanceolate, tetragonal, tricarinate, the lateral ridges curved, margins also ridged: antennæ conical, setiform filament twice as long as the preceding part: pronotum very short: mesonotum tricarinate: tegmina broad with numerous transverse veinlets along the costa; ulnar areas elongate towards the base of the tegmina; apical areas more numerous, short, and generally 5—6 angled (*Walker*).

49. ELICA LATIPENNIS, Walker.

Elica latipennis, Walker, J. Linn. Soc. Zool. i, p. 86 (1856).

Testaceous, partly tawny: head above and disc of the thorax, brown: tegmina hyaline with a slight testaceous tinge; veins tawny, some of them black, forming an irregular, incomplete band (*Walker*). Body long, 7¼; teg., 19 millims.

Reported from Malacca.

Genus MONOPSIS, Spinola.

A. S. E. F. viii, p. 302 (1839); Amyot & Serville, Hist. Nat. Ins. Hém. p. 507 (1843); Walker, List Hom. B. M. ii, p. 325 (1851).

Cephalic prolongation flattened above, ovally rounded anteriorly; the flat portion of the vertex has a median ridge dividing into two lines posteriorly which form a very pointed arch placed above another arch on the pronotum; frons broad with a median and two lateral ridges: eyes large, oblong: pronotum very narrow, emarginate posteriorly in an arch; mesonotum with three elevated lines: tegmina slightly crystalline and transparent almost as in the genus *Dichoptera*; the great basal half with long cells, then comes a small elevated transverse line and then a great number of small and more or less quadrate cells: abdomen rather flat and oblong: feet moderate (*Am. & Serv.*).

50. MONOPSIS VIRIDICANS, Stål.

Monopsis viridicans, Stål, Freg. Eug. Resa. Ins., p. 281 (1859).

♀. Weakly virescent: vertex nearly semicircularly produced before the eyes; frons one and half time longer than the breadth, carinated; thorax somewhat longer than the vertex, roundly produced anteriorly, tricarinate, the lateral ridges oblique: scutellum tricarinate, the lateral ridges somewhat divergent towards the base, parallel, nearly three and half time longer than the breadth (*Stål*). Long with teg., 7 millims.

Reported from Hong-Kong, Sikkim (?).

51. MONOPSIS (?) SINICA, Walker.

Monopsis sinica, Walker, List Hom. B. M. ii, p. 327 (1851).

♀. Body fusiform, yellowish-green: head and thorax tawny above, the former surrounded by a bright green ridge on each side and in front and with three others of which the lateral pair do not extend beyond the disc from the hind border: pronotum with three bright green ridges, the side pair oblique, longer than the median one: rostrum and legs pale yellowish-green: feet tawny; hind tibiæ between the middle and the tips, with three spines having black tips: tegmina and wings colourless, the basal part of the former pale green, occupying two-thirds of the surface, covered with little tawny tubercles, very distinct from the reticulated part; veins green. Body long 3½; exp. teg., 10½ millims.

Reported from Hong-Kong.

Genus HIRACIA, Walker.

J. Linn. Soc. Zool. i, p. 154 (1857).

Body elliptical convex: head with the borders hardly elevated; vertex conical, distinctly tricarinate; frons and face indistinctly tricarinate, the former obconical, excavated next the face which is lanceolate: pronotum full twice broader than long, narrower in front, 5-carinate; mesonotum triangular, acuminate, tricarinate: tegmina acuminate with numerous rugulose veins and transverse veinlets (*Walker*).

52. HIRACIA WALKERI, Signoret.

Hiracia walkeri, Signoret, A. S. E. F. (4 sér.) i, p. 57, t. 2, f. 3 (1861).

Yellowish-grey with two black patches on the tegmina: head weakly angular in front with a median keel on the frons: vertex grooved with the margins strongly carinated, posterior margin concave: pronotum angular, rounded in front, furnished with a great number of small tubercles along the anterior margin and on its disc and a median transverse impression: scutellum weakly tricarinate: tegmina with veins without anastomoses but faintly reticulated in the intervals, a median triangular black spot towards costal margin and an oblong spot behind towards the internal margin; abdomen yellowish, shorter than the tegmina; feet yellow, very long; posterior tibiæ furnished on the external sides with seven spines, a character which serves to separate this species from *H. ignava*, Walker, from Borneo (*Sign.*). Body long, 7; broad, 3 millims.

Reported from India.

Subfam. DERBINA, Stål.

Derbida, Hem. Afric. iv, pp. 130, 192 (1866); *Derbina*, Ofvers. K. V.-A. Förh. p. 750 (1870).

Head very often narrower than the thorax: sides of clypeus sometimes carinated: last joint of rostrum short or very short; thorax posteriorly angularly-emarginate, ecarinate or furnished with an obsolete ridge: costa simple; clavus generally as in *Achilina:* last tibiæ very often unarmed, rarely spinose; first joint of last tarsi, elongate (*Stål*).

Genus PHENICE, Westwood.

Trans. Linn. Soc. xix, p. 10 (1845); Stål, Ofvers. K. V.-A. Förh. p. 163 (1856); Hem. Afric. iv, pp. 192, 195 (1866). Amyot & Serville [Hist. Nat. Ins. Hém. p. 515 (1843)] unite *Phenice* with *Derbe*, Fabr. for reasons given; the remainder of the species described are chiefly African.

Body oval: head much narrower than the thorax, seen from the side, more or less rounded anteriorly, slightly compressly prominulous before the eyes; vertex and frons very narrow, the latter linear with the lateral margins sometimes contiguous; clypeus long, tricarinate: eyes posteriorly sinuate beneath, extended to a distance downwards: no ocelli: second joint of the antennæ varying in length, oval or a little elongate, without a sinus at the apex above: last joint of rostrum very minute: thorax short, posteriorly deeply angularly-emarginate: scutellum obsoletely tricarinate: tegmina elongate, gradually amplified from the base to the middle, thence somewhat narrowed or furnished with parallel sides, much longer than the wings; clavus short; radial vein forked, ulnar vein emitting inwards obliquely longitudinal branches towards the commissural margin, these branches united by a transverse vein: feet slender, last tibiæ sometimes spinose (*Stål*).

53. PHENICE MŒSTA, Westwood.

Derbe (Phenice) mœsta, Westwood, A. M. N. H. (2 sér.) vii, p. 209 (1851).
Derbe mœsta, Walker. List Hom. B. M. ii, p. 397 (1851).
Phenice mœsta, Stål, Ofvers, K. V.-A. Förh. p. 750 (1870).

Black, variegated white: a narrow frontal ridge on the head and the penultimate joint of the rostrum, whitish: three very fine ridges on the mesonotum and the posterior margin broader in the middle, white: feet white: tegmina black, costa and last half spotted white: wings smoky: lateral anal appendages in ♂, straight, incurved at the apex and acuminate (*Westwood*). Exp. teg., 13½ millims.

Reported from India.

54. PHENICE CARNOSA, Westwood.

Derbe (Phenice ?) carnosa, Westwood, A. M. N. H. (2 sér.) vii, p. 209 (1851).

Entirely luteous flesh-coloured; four anterior tibiæ, fuscous: tegmina and wings yellowish hyaline, costal margin behind the middle of the tegmina and external margin of the wings, fuscous, the latter with a median black dot: apical joint of rostrum, black: anal appendages in ♂, elongate, curved, forcipate: abdomen in ♀ terminated by two porrect horns (*Westwood*). Exp. teg., 14½ millims.

Reported from India.

Subfam. LOPHOPINA, Stål.

Lophopida, Stål, Hem. Afric. iv, pp. 130, 199 (1866).

Head narrower than thorax, sides of clypeus carinate; rostrum short, stout, last joint very short; thorax truncate at the base, carinated or tuberculated on the disc; first joint of last tarsi robust, less long. Differs from the *Tropiduchina* in having the thorax truncated at the base, the last joint of the tarsi very short and the basal joint of last tarsi stoutish short or somewhat shortish: from the *Issina* in having the thorax distinctly tricarinated or tuberculated on the disc, the tegmina rather ample, flat, and extending much beyond the apex of the abdomen and from the *Ricaniina* in having the thorax truncated at the base, disc distinctly carinated or tuberculated and last joint of rostrum very short (*Stål*).

Genus LACUSA, Stål.

Berlin Ent. Zeitschr. vi, p. 309 (1862); Hem. Afric. iv, p. 199 (1866).

Head somewhat narrower than the thorax; vertex not produced, somewhat transverse, lateral margins not dilated; frons elongate, furnished with two ridges converging upwards; clypeus carinate in the middle and on both sides: thorax truncated at the base, rounded anteriorly behind the vertex, tricarinate: scutellum tricarinate: tegmina rather ample, costal and commissural margins parallel, broadly rounded at the apex, costal limbus obliquely, transversely veined: anterior feet much dilated, foliaceous: last tibiæ trispinose, gradually slightly dilated towards the apex (*Stål*). Allied to *Elasmoscelis*, but distinct in the structure of the head.

55. LACUSA FUSCOFASCIATA, Stål.

Elasmoscelis (?) fusco-fasciata, Stål, Ofvers. K. V.-A. Förh. p. 248 (1854).
Cixius eminens, Walker, Ins. Saund. Hom. p. 42 (1858).
Lacusa fusco-fasciata, Stål, Berlin Ent. Zeitschr. vi, p. 309 (1862).

♂ Black-fuscous: head, thorax, scutellum, rostrum, and tarsi testaceous-whitish, frons and scutellum infuscate: tegmina and wings vitreous; three bands on the tegmina, the posterior two oppositely oblique and united at the commissure, confluent spots on the apex, small transverse lines on the costal limbus and dots sprinkled over the disc, black-fuscous; wings internally and at the apex broadly fuscescent; feet sparingly sprinkled pallid (*Stål*). Body long, 5½; exp. teg., 16½ millims.

Reported from India.

Genus Corethrura, Hope.

Trans. Linn. Soc. xix, p. 135 (1845); Stål, Hem. Afric. iv, p. 200 (1866).

Body short, stout: the apex of the abdomen furnished with a very large and well-marked floccose appendage: head carinate in front: face seen in front narrow: rostrum of median length: clypeus large, inflated: antennæ inserted beneath the eyes, very short, setose to some length at the apex: ocelli minute placed a little before the eyes: first pair of feet with depressed tibiæ, last tibiæ externally tridentate (*Hope*).

56. Corethrura fuscovaria, Hope.

Corethrura fusco-varia, Hope, Trans. Linn. Soc. xix, p. 135, t. 12, f. 60 (1845); Walker, List Hom. B. M. ii, p. 395 (1851).

Body above somewhat fuscous; head with a whitish transverse line, three rows of white spots on the thorax: abdomen fuscous-green, extremity provided with a subochraceous cottony appendage longer than the entire body: tegmina varied with fuscous, having numerous interrupted bands of a more saturated colour and patches of a farinose powdery substance: wings paler brownish, hyaline, immaculate (*Hope*). Body long, 19; exp. teg., 58-59 millims.

Reported from Silhat.

Subfam. Issina, Stål.

Issida, Stål, Hem. Afric. iv, pp. 130, 202: *Issina*, Ofvers. K. V.-A. Förh. p. 754 (1870).

Head not or only a little narrower than the thorax; clypeus very often convex, lateral margins very rarely furnished with a ridge; thorax truncated at the base, rarely broadly roundly-sinuated, without a median ridge or only an obsolete one; scutellum short, rarely twice longer than the thorax: tegmina coriaceous or subcorneous, rarely vitreous, very rarely flat, more or less convex, sometimes very much abbreviated: clavus and claval vein generally as in *Achilina*: first joint of last tarsi short or moderate very rarely elongate. Differs from *Ricaniina* in the thorax being truncated or slightly sinuated at the base, scutellum short never more than twice as long as the thorax; tegmina very ample, very often convexish, not or but little extending beyond the abdomen (*Stål*).

Genus Hemisphærius, Schaum.

Allg. Enc. Wissensch. Kunst. i, p. 51, (1850): Stål, Hem. Afric. iv, p. 203 (1866).

Last joint of rostrum longer than stout, oval, oblong or elongate: tegmina entirely convex, very obsoletely veined or without veins, clavus and corium connate, no claval suture: body depressed; vertex narrower than the eyes or subequal in breadth; thorax truncated at the base, sinuated behind the eyes, sides behind the eyes hardly visible from above; last tibiæ bispinose: anterior femora simple (*Stål*). This beautiful genus has the entire tegmina quite coriaceous like those of the lady-bird beetles.

57. Hemisphærius rufovarius, Walker.

**Hemisphærius rufovarius*, Walker, List Hom. B. M. Suppt. p. 95 (1858); Butler, A. M. N. H. (5 sér.) xvi, p. 96 (1875).

Testaceous: vertex transverse with a red mark on the disc, frons and face flat; frons with a red disc, face black, lanceolate: pronotum with three minute red marks: mesonotum with a red stripe on each side: abdomen with a black band beneath: tegmina rather narrower and more oblong than in the other species of the genus (*Walker*). Body long, $3\frac{1}{2}$; teg., $8\frac{1}{2}$ millims.

Reported from Burma.

Genus Flavina, Stål.

Öfvers. K. V.-A. Förh. xviii, p. 209 (1861); Hem. Afric. iv, p. 206 (1866).

Wings cleft, fairly ample, irregularly reticulated; head distinctly narrower than the thorax, vertex subquadrate; frons slightly rounded a little above the clypeus on both sides, longer than broad; clypeus ecarinate; thorax truncated at the base, angulated anteriorly behind the vertex; scutellum somewhat longer than the thorax, tegmina extending somewhat beyond the abdomen, the costa and the commissure subparallel, gradually roundly-narrowed at the apex; the principal exterior vein near the base, the median vein towards the apex and interior vein before the middle, forked, the two last united before the middle by a more distinct transverse veinlet, the interior branch of the fork of that vein also forked: last tibiæ 5-spinose (*Stål*).

58. FLAVINA GRANULATA, Stål.

Flavina granulata, Stål, Ofvers. K. V.-A. Förh. xviii, p. 212 (1861).

♀. Weakly yellow-testaceous; tegmina sparingly sprinkled fuscous, extreme part of angles of vertex and basal angles of frons, fuscous; frons scarcely twice as long as its median breadth, furnished with a median ridge obliterated near the clypeus and a small subbasal, transverse, angulated ridge; thorax granulate; scutellum unicarinate; anterior tibiæ with two broadly, weakly fuscous rings (*Stål*). Long with teg., 8 millims.

Reported from India.

Genus EUPILIS, Walker.

J. Linn. Soc. Zool. i, p. 93 (1856); Stål, Hem. Afric. iv, p. 207 (1866); Berlin Ent. Zeitschr. x, p. 393 (1866); Ofvers. K. V.-A. Förh., p. 760 (1870).

Body very oblong: clypeus transversely convex before the middle, not compressly elevated: tegmina membranous, vitreous, very oblong, scarcely gradually amplified towards the apex, obtusely rounded at the apex; exterior branch of the radial vein running out at the costa or sending out a short branch to the costa; claval veins united almost in the middle of the clavus; wings emarginate at the apex, with two veins running towards the apical incisure united towards the apex: last tibiæ bispinose behind the middle (*Stål*).

59. EUPILIS ALBILINEOLA, Walker.

Eupilis albilineola, Walker, J. Linn. Soc. Zool. i, p. 93 (1856); p. 162 (1857).

♀. Testaceous, partly pale-green: frons black, shining, with a tawny central spot and with a testaceous border: face with two black bands, the anterior one macular: thorax and pectus with black spots: abdomen with black bands: tegmina and wings transparent, veins black; the tegmina slightly lurid with five brown streaks; transverse veinlets, white (*Walker*). Body long 8¼; teg., 25 millims.

Reported from Singapore.

Genus TEMPSA, Stål.

Hem. Afric. iv, p. 208 (1866); Ofvers. K. V.-A. Förh. p. 761 (1870).

Body oblong, somewhat cylindrical: head and thorax somewhat equal in breadth, the former obtuse: vertex subequal in breadth to the eyes, truncated, transverse, not produced before the eyes; clypeus transversely convex before the middle, not compressly elevated, sides without a ridge: frons somewhat longer than broad, narrowed upwards, with a longitudinal ridge: thorax anteriorly angulated, truncated at the base;

scutellum longer by more than half than the thorax: tegmina oblong somewhat narrowed towards the apex, obliquely truncated at the apex; coriaceous, somewhat opaque or slightly pellucid; interior ulnar vein simple or forked at a greater distance from the base than the exterior ulnar vein; exterior branch of the radial vein continued towards the apex of the corium, emitting no branch to the costa; claval veins united behind the middle of the clavus; wings broad, with two veins running towards the apical incisure united towards the apex: last tibiæ bispinose behind the middle (*Stål*).

60. TEMPSA MALAYA, Stål.

Issus malayus, Stål, Ofvers. K. V.-A. Förh., p. 246 (1854).
Eupilis malaya, Stål, Freg. Eug. Resa Ins., p. 277 (1858).
Tempsa malaya, Stål, Berlin Ent. Zeitschr. x, p. 393 (1866).

♂. Elongate, sordid flavescent, obscurely spotted: frons tricarinate the median ridge distinct, continued through, the lateral ridges obsolete, two spots in the middle and four spots on the scutellum, black-fuscous: tegmina elongate, subparallel, longer than the abdomen, somewhat ferruginous, costal margin of a weaker colour. Head sordid flavescent, obscurely spotted, at the apex before the eyes a little truncately produced, vertex quadrate, with a transverse somewhat arched ridge at the apex; frons one-third narrower than its length, very broad towards the apex, gradually somewhat narrowed towards the base, tricarinate, the median ridge continued through, distinct, the lateral ridge obsolete, converging much towards the base, confluent at the base, in the middle on both sides at the median ridge, fuscous: thorax as long as the vertex, triangularly produced, fuscous-flavescent, somewhat impressed lengthwise: scutellum scarcely twice as long as the thorax, obsoletely tricarinate, sordid flavescent, with four small fuscous spots: tegmina extending beyond the abdomen, thrice as long as the median breadth, gradually a little amplified from the base, thence scarcely gradually amplified, obliquely subtruncate at the apex, with longitudinal veins, veins robust, remotely united by other less distinct transverse veins; with a ferruginous tinge, costal margin weak testaceous-flavescent, subhyaline: wings sordid hyaline with fuscous veins, as long as the tegmina: beneath with feet, weak sordid flavescent (*Stål*). Long with teg., 9; broad, 3½ millims.

Reported from Malacca, Singapore.

Genus TETRICA, Stål.

Hem. Afric. iv, p. 208 (1866).

Body oval or suboblong: frons subtruncate at the apex, narrowed upwards, unicarinate; last joint of rostrum oblong or subelongate; thorax and scutellum together, transverse, the former truncated at the base, anteriorly obtusely angulated, the latter about twice longer than the thorax: tegmina slightly narrowed behind the middle, at the apex very obtusely rounded; corium a little longer than the clavus; radial vein of tegmina forked at the base, ulnar veins forked in the middle or a little before the middle: wings very broad, deeply emarginate at the apex: last tibiæ bispinose: first joint of last tarsi rather short. Head and thorax equally broad, the former not prominulous before the eyes, vertex transverse, subequal in breadth to the eyes; frons equally long and broad, amplified near the apex: sides of clypeus furnished with a ridge: body a little compressed (*Stål*). Type, *T. fusca*, Stål.

61. TETRICA FUSCA, Stål.

Tetrica fusca, Stål, Ofvers. K. V.-A. Förh. p. 757, note, (1870).

♂. Fuscous, subcompressed, feet pallescent: corium and clavus obsoletely sprinkled pale on the disc: vertex twice broader than long: frons nearly equally long and towards the apex broad, furnished with a single, distinct, obtuse ridge running through it, continued through the clypeus: tegmina somewhat broadish, gradually a little amplified from the base scarcely to the middle, thence distinctly narrowed (*Stål*). Long with teg., 5½ millims.

Reported from Burma.

Species of doubtful position.

62. ISSUS (?) PECTINIPENNIS, Guérin.

Issus pectinipennis, Guérin, Voy. Bélanger Ind. Orient. p. 475 (1834); Spin., A. S. E. F. viii, p. 347 (1839): Walker, List Hom. B. M. ii, p. 362 (1851).

Luteous spotted with black: head transverse, anteriorly trispinose, one obtuse point in front of each eye and one forming a prolongation of the frons: tegmina anteriorly dilated, luteous or ochraceous-yellow, with some small tubercles and short transverse streaks, black; wings brunneous: body beneath yellow, variegated with black; feet flavescent. The anterior margin of the tegmina is spinose; it comprises a limbus outside the radius as broad as the external flap of the wing, about half a line, transparent, vitriform, or like an exceedingly fine plate of talc, furnished throughout with oblique veins (parallel to each other) contrasting in colour and substance with that of the limbus itself. These veins when the limbus is injured stand out like the teeth of a comb and give a peculiar appearance to the insect. The frons is ascending and is divided from the base to the upper margin into three facettes which form between them obtuse angles; the median increases from below upwards and reaches the vertex and is divided by a longitudinal ridge which descends from above and loses itself towards the middle of the frons; the two interior facettes rise a little higher than the median but without converging above it; they bend outwards and end in an acute and prominent point above the eyes. The vertex is broader than long, concave, margins gently raised, anterior bisinuate, posterior weakly emarginate. Median lobe of pronotum broad, rounded. Long, 10; exp. teg., 23 millims.

Reported from Bengal.

63. Issus (?) TESTUDINARIUS, Stål.

Issus testudinarius, Stål, Ofvers. K. V.-A. Förh., p. 246 (1854).

Obscurely ferruginous: frons with a longitudinal ridge in the middle and a transverse one at the base: tegmina coriaceous, longitudinal veins elevated: beneath and feet yellow-testaceous: entire anterior femora and last pair at the apex, fuscescent: abdomen, fuscous in the middle (*Stål*). Long, 8; broad, 6 millims.

Reported from Penang.

Genus CYRENE, Westwood.

Arc. Ent. ii, p. 35 (1843).

Body short, stout, abdomen compressed: head with frons conical, long, porrect, acute at the apex, carinate above at the sides, ridges obliterated before the apex, posteriorly extended to the pronotum: eyes large, lateral, emarginate beneath: no ocelli: antennæ small, inserted below the eyes: pronotum as long as the mesonotum, disc impressed in the middle with two points: tegmina coriaceous, opaque, homogeneous, convex, broad; anterior margin sinuate, rounded at the apex, posterior angle, acute; veins little branched: feet short, robust, last tibiæ curved, armed inwards towards the apex with three spines: abdomen truncated at the apex, ending in two lobes, furnished with a slender, erect appendage, concave at the apex (*Westwood*). The entire surface of the tegmina is covered with an immense number of minute, circular, elevated areas, visible only under the lens and which give it a shagreened appearance: when at rest the tegmina are carried almost perpendicularly.

64. CYRENE FUSIFORMIS, Walker.

Cyrene fusiformis, Walker, List Hom. B. M. Suppt. p. 47 (1858).
Chalepus aconophoroides, Walker, l. c. p. 192 (1858).

♂, ♀. Testaceous: head produced in a lanceolate horn which is straight, hardly ascending, a little longer than the thorax and has three slight ridges above and beneath: tegmina very convex in front, straight along the interior border, very acute at the tips, with several indistinct, ramified brown marks, veins few: wings vitreous, tinged with grey, a testaceous tinge towards the base; veins few, pale (*Walker*). Body long 10½-12½; teg. 19-23 millims.

Reported from N. China, India: the Indian Museum has a specimen from Sikkim.

65. CYRENE WESTWOODI, Signoret.

Cyrene westwoodi, Signoret, A. S. E. F. (4 sér.) ii, p. 124, t. 1, f. 5, A. B. C. (1862).

Brown yellow: a whitish-yellow line extends from the tip of the head to the end of the tegmina which have several dots of the same colour on the disc and are granulate through the whole length so as to have the appearance of being shagreened: head once and half longer than broad, including the eyes, black at the extremity and with a whitish yellow median band, a little elevated; sides carinate: frons concave at the base and grooved, quadricarinate towards its upper third; the two median ridges reaching the extremity of the head; whereas the two lateral ridges proceed obliquely upwards, contour the head and lose themselves in the lateral ridges of the vertex towards its upper third: rostrum short not extending beyond the posterior coxæ: eyes not emarginate, oval. Pronotum thrice broader than long, rugose, especially towards the anterior and posterior borders with an elevated whitish yellow band and on each side a sunken spot; posterior margin truncated straightly, anterior convex with a strong emargination below the eyes: mesonotum triangular and remarkable for a ridge or rather transverse fold near the anterior margin and very distinct from it this fold appears a little below the latter and extends from one humeral angle to the other and also a little below. Tegmina concave, shell-shaped, with the posterior angle acute, the anterior margin convex, rounded, a little concave on reaching the posterior angle, posterior or sutural margin straight and whitish, the entire surface shagreened; veins numerous and branched towards the tip, several whitish dots on the disc: wings transparent hyaline: abdomen reddish yellow, compressed: feet brown-yellowish; posterior femora with two lateral spines towards the extremity (*Sign.*). Body long, 14; teg. extended, 22 millims.

Reported from Cochin-China, Burma (?).

Subfam. RICANIINA, Stål.

Ricaniida, Stål, Hem. Afric. iv, p. 131, 219 (1866); *Ricaniina*, Ofvers. K. V.-A. Forh., p. 765 (1870).

Head broad or very broad, sometimes somewhat narrower than the thorax; sides of clypeus very often without a ridge; thorax posteriorly roundly sinuated, without ridges or furnished only with an obsolete median ridge: scutellum very large, long: tegmina flat, ample or very ample, costa dilated; costal membrane transversely veined or reticulated: last tibiæ spinose; first joint of last tarsi short or shortish. Differs from *Tropiduchina* in having the thorax without discoidal ridges or only with a single rather obsolete one and the first joint of the last tarsi being short or shortish *(Stål)*.

Genus Ricania, Germar, Stål.

Mag. Ent. iii, p. 221 (1818); Stål, Hem. Afric. iv, p. 221 (1866): Fieber, Rev. Mag. Zool. (3 sér.) ii, p. 342 (1875).

Germar formed this genus from *Flata*, Fabr., taking the Indian species *R. hyalina*, Fabr., as his type with the following description:—'Head short, transverse: frons lower, subovate, margined on the sides: clypeus annexed to the apex of the frons, conical, subulate at the apex: labrum concealed; rostrum shorter than half the body; eyes globose, pedunculate above: ocelli inserted on the lower margins of the eyes: antennæ distant from the eyes, short, first joint minute, cylindrical, second short, thicker at the apex, obliquely truncated, setigerous.' This was subsequently reduced by the creation of several genera which Stål reviews, absorbing some, and making other sections or subgenera.

Stål includes in *Ricania* his own genus *Scolypopa* (Berl. Ent. Zeitschr. iii, p. 325, 1859) and gives the following diagnosis of the genus:—

Body very broad, not prominent before the eyes anteriorly truncate or obtusely rounded: vertex very broad, short; frons transverse or equally long and broad, very often keeled; sides of clypeus without a ridge: thorax slightly arched, very often furnished with a fine ridge in the middle: scutellum furnished with three ridges running through it and anteriorly on both sides with an abbreviated ridge: tegmina varying in form and size, very often triangular and very ample; basal tegula large or somewhat largish; two veins emitted from the base of the clavus united in the middle or behind the middle of the clavus: wings moderate or small, anal area furnished with a simple vein: feet moderate, simple; last tibiæ very often bispinose, very rarely trispinose.

The principal divisions or subgenera are:—

1. *Pochazia*, Am. and Serv. Hist. Nat. Ins. Hém. p. 528 (1843); which includes *R. fasciata*, Fabr., and various African and Indian species.

2. *Tarundia*, Stål, Berlin Ent. Zeitschr. iii, p. 325 (1859) and Rio Jan. Hem. ii, p. 70 (1862); which includes several species from Africa and the Indian Archipelago.

3. Represented by *R. quinquefasciata*, Stål, from Africa.

4. *Mulvia*, Stål, formerly represented by African species.

5. *Deraulax*, Signoret, A. S. E. F. (3 sér.) viii, p. 191 (1860); type *D. versicolor*, Sign. [*l. c.*], from Madagascar.

6. *Pocharica*, Signoret, *l. c.*, p. 192 (1860); type, *P. ocellata*, Sign., [*l. c.*, p. 192 (1860)], from Madagascar.

7. *Pochazoides*, Signoret, *l. c.*, p. 193 (1860); type, *P. maculatus*, Sign. [*l. c.*, p 193 (1860)], from Madagascar.

8. *Privesa*, Stål, Rio Jan. Hem. ii. p. 70 (1862); type, *R. lævifrons* Stål [Stettin Ent. Zeit. xxii, p. 151 (1861)], from Mozambique.

Out of the eight subgenera, the Indian species, hitherto recorded, fall under the first two and principally under the first, *Pochazia*.

66. RICANIA HYALINA, Fabricius.

Cercopis fenestrata, Fabricius, Syst. Ent. p. 688 (1775); Stoll, Cig. p. 75, t. 19, f. 102 (1788).

Cicada hyalina, Fabr., Syst. Ent. App. 832 (1775); Spec. Ins. ii, p. 326 (1781); Mant. Ins. ii, p. 272 (1787); Ent. Syst. iv, p. 40 (1794).

Flata hyalina, Fabr. Syst. Rhyng. p. 51 (1803).

Ricania hyalina, Germar, Mag. Ent. iii, p. 224 (1818); Burm., Handb. Ent. ii (i) p. 161 (1835).

Flatoides hyalina, Walker, List Hom. B. M. ii, p. 404 (1851).

Flatoides orientis, Walker, l. c., p. 417 (1851).

Ricania fenestrata, Stål, Ofvers. K. V.-A. Förh. p. 489 (1862); Hem. Fabr. ii, p. 105 (1869).

Body small, entirely ferruginous-fuscous: tegmina broad of the same colour, with an abbreviated, broad, hyaline band in the middle, behind the band two small hyaline spots and the posterior margin, interrupted in the middle, hyaline: wings fuscous, immaculate (*Fabr.*).

Fabricius (in Spec. Ins. l. c.) abandons the name '*fenestrata*' first given by him to this species which was evidently based on an error both of description and in the locality (S. America) assigned to the species. The rectification of the author should be accepted, especially as he gives the name '*fenestrata*' subsequently (Syst. Rhyng. p. 51) to a different species. This is Germar's type of the genus. Long, 5¼; teg., 16¼ millims ?

Reported from Ceylon, India; the Indian Museum possess a specimen from Calcutta (?).

67. RICANIA FENESTRATA, Fabricius.

Flata fenestrata, Fabr., Syst. Rhyng. p. 51 (1803).

Flatoides fenestrata, Walker, List Hom. B. M. ii, p. 404 (1851).

Ricania Fabricii, Stål, Hem. Fabr. ii, p. 104 (1868).

Stature entirely of *R. hyalina*, Fabr., but smaller: body black: tegmina fuscous, hyaline at the base, spot on the anterior margin and punctures, fuscous; in the middle a broad oblique hyaline band and numerous spots, hyaline: entire wings obscure hyaline (*Fabr.*). Allied to *R. mellerborgi*, Stål.

Reported from Java.

68. RICANIA MELLERBORGI, Stål.

Ricania mellerborgi, Stål, Ofvers. K. V.-A. Förh. xi, p. 247 (1854).
Flatoides discalis, Walker, J. Linn. Soc. Zool. i, p. 89 (1856); p. 156 (1857).

Testaceous: tegmina fuscous with a large transverse patch and spots on the margin, whitish-hyaline. Allied to *R. fenestrata*, Fabr. Long., 5; exp. teg., 16 millims.

Reported from Java, Borneo, Singapore, Burma.

Walker's *F. discalis*, is black: frons much broader than long, with a slightly elevated margin and slightly tricarinate: posterior margins of segments of abdomen and the legs dull testaceous: tegmina blackish, with a testaceous dot on the tip of each vein; disc limpid; two limpid dots on the costa and two towards the tip of the exterior border: wings limpid with brown borders. Body long, 6¼; teg., 16¾ millims.

69. RICANIA OBSCURA, Fabricius.

Flata obscura, Fabricius, Syst. Rhyng. p. 49 (1803); Germar in Thon's Archiv. ii (2) p. 49 (1830): Walker, J. Linn. Soc. Zool. i, p. 92 (1856); p. 161 (1857).
Pochazia obscura (?) Walker, List Hom. B. M. ii, p. 426 (1851).
Ricania obscura, Stål, Hem. Fabr. ii, p. 104 (1869).

♀. Pale testaceous-flavescent, vertex and thorax fuscous-testaceous, scutellum black: tegmina ferruginous-fuscous, sprinkled pale before the middle and in the middle, and with small pale transverse lines, an unequal narrow band placed behind the middle and the costal membrane obscurely fuscous, the extreme part of its margin pallid, a small oblique transverse line, behind the middle of the costal margin, whitish: wings fuscescent, apical margin of the two last ventral segments black towards the sides. Frons about one-third shorter than broad, gradually roundly narrowed towards the apex, distinctly tricarinate: scutellum 5-carinate, lateral ridges oblique: tegmina triangular; claval suture and apical margin equally long, the latter very slightly subrotundate; costal margin, gradually slightly rounded; apical commissural angle somewhat obtusish, distinct; apical costal angle somewhat rounded; longitudinal veins rather numerous, transverse discoidal veins rare; the posterior transverse veins arranged in two rows, the anterior irregular, the posterior regular and continued; the interior ulnar vein emitting many branches outwards (*Stål*). Body long, 5½; exp. teg., 15 millims.

Reported from Amboina, Borneo, Singapore, India.

70. RICANIA FUSCATA, Fabricius.

Cicada fuscata, Fabricius, Ent. Syst. iv, p. 28 (1794).

Flata fuscata, Fabr., Ent. Syst. Suppt., p. 518 (1798); Syst. Rhyng., p. 47 (1803).

Ricania obscura, Guérin, Voy. Bélanger Ind. Orient. Zool., p. 466 (1834).

Euryptera obscura, Guérin, l. c. Atlas, t. 3, f. 6 (1834).

Pochazia obscura, Stål, Ofvers. K. V.-A. Förh., p. 160 (1865); Walker, List Hom. B. M. ii, p. 426 (1851).

Pœciloptera antica, Westwood, Griffith's An. King. Ins. ii, p. 260, t. 90, f. 4; t. 138, f. 4 (1832).

Pochazia fumata (?) pt., Walker, l. c. p. 426 (1851).

Ricania fuscata, Stål, Hem. Fabr. ii, p. 104 (1879).

Head fuscous, frons flat, margin and median line elevated: thorax dull black, a dorsal and smaller incurved lateral line, elevated: abdomen fuscous: tegmina and wings deflexed, truncated, hyaline-black, immaculate: feet fuscous (*Fabr.*).

Dark brown with a small spot near the middle of the anterior margin; the lower wings are covered with a bluish powder at the base: apparently belongs to *Euryptera*, Guérin (Gray in Griffith, *l. c.*).

Obscure, somewhat cœrulean, covered with a powdery substance; thorax tricarinate: tegmina triangular, anterior margin somewhat straight, wings concolorous; feet abbreviated, brunneous-ferruginous (*Guérin*). Long 9: exp. teg. 30 millims. Stål identified this from the type with his own *P. obscura* which in Hem. Fabr. (*l. c.*) he makes one with *R. fuscata*, Fabr.

♂. Blackish; abdomen and feet pale fuscous-testaceous: tegmina and wings obscurely fuscous, the former marked behind the middle of the costal margin with a small, more or less distinct, flavescent greyish spot; costal and apical margins not sinuated towards the apical costal angle: wings behind the middle with the veinlets irregularly arranged and furnished towards the apex with a row of veinlets; frons very transverse, very roundly narrowed towards the apex, furnished with a median longitudinal ridge (*Stål*). Body long, 7—8; exp. teg., 29—32 millims.

Reported from Tranquebar, Java, Cambodia, Burma: the Indian Museum possesses a specimen from N. India.

71. RICANIA FUMATA, Am. & Serv.

Pochazia fumata, Am. & Serv., Hist. Nat. Ins. Hém. p. 529 (1843); Walker, List Hom. B. M. ii, p. 426 (1851), excl. syn.; J. Linn. Soc. Zool. i, p. 91 (1856) p. 160 (1857) and x, p. 163 (1867): Stål, Berlin Ent. Zeitschr. vi, p. 314 (1862).

In all respects similar to *R. fasciata*, Fabr., but without a hyaline band or spot. Black-fuscous, beneath with feet and vertex sordid yellow-livid; tegmina and wings fuscous-pellucid, in certain positions shining subviolaceous; small marginal space on the tegmina at the costal sinus obsoletely pallescent. Frons almost half broader than the length, lateral margins slightly converging at the base, gradually rounded beneath the middle towards the apex, tricarinate, the median ridge somewhat continued through, the two lateral more obsolete, continued from the base scarcely to the middle: the apical margin of the tegmina somewhat longer than the commissural margin, very slightly sinuate between the middle and the apical angle, costal margin broadly distinctly sinuate a little behind the middle: wings furnished posteriorly with transverse veinlets arranged in two rows, the posterior row more regular: last tibiæ armed with two distinct spines behind the middle and before the middle (always?) with a small spinule (*Stål*). Exp. teg., 41 millims.

Reported from Java, Sumatra, Borneo, Malacca, Singapore, Tenasserim.

72. RICANIA SINUATA, Stål.

Pochazia sinuata, Stål, Ofvers. K. V.-A. Förh. p. 160 (1865).

Pochazia fasciata, Am. & Serv. [nec Fabr.], Hist. Nat. Ins. Hém. p. 528, t. 9, f. 7 (1843): Walker, List Hom. B. M. ii, p. 426 (1851); J. Linn. Soc. Zool. i, p. 91 (1856).

♂. Blackish; beneath with feet fuscous-testaceous; tibiæ and tarsi, paler; tegmina and wings black-fuscous, the former slightly shining violaceous; a band on the tegmina placed behind the middle abbreviated near the costal margin and sometimes interrupted, and a median band on the wings abbreviated towards the anal area, whitish. Stature entirely of *R. fumata*, A. & S.: the frons with obsolete longitudinal striæ and three obsolete ridges: wings behind the middle with two abbreviated transverse rows of transverse veinlets; costal apical angle of tegmina a little more produced than in *R. fumata* (*Stål*). This species is often confounded with *R. fasciata*, Fabr., which is somewhat like in the marking, but differs in having the costal and apical margins of the tegmina straight and not sinuated, the exterior apical angle less produced and the head somewhat narrower, and is moreover an African species. Long, 8½; exp. teg., 35 millims.

Reported from Singapore, Malacca.

73. RICANIA SPECULUM, Walker.

Flatoides speculum, Walker, List Hom. B. M. ii, p. 406 (1851).

Flatoides tenebrosus, Walker, l. c. p. 406 (1851): J. Linn. Soc. Zool. i, p. 89 (1856).

Flatoides perforatus, Walker, l. c. p. 407 (1851) : J. Linn. Soc. Zool. x, p. 147 (1867).
Ricania malaya, Stål, Ofvers. K. V.-A. Förh. p. 247 (1854).
Ricania speculum, Stål, l. c. pp. 489, 491 (1862).

♀. Body black : legs ferruginous : tegmina brown with five colourless or whitish-hyaline spots, two on the disc, one near them on the costal margin, and two on the apical margin, of which the one nearer the posterior angle is sometimes interrupted so as to appear two, veins brown, whitish on the colourless parts : wings paler brown, pellucid, with many almost colourless dots. Body long, 6—8½ ; teg., 21—24 millims.

Reported from Philippines, China, Malacca, Singapore : the Indian Museum possesses a series from Pankabári, Sikkim, Sibságar (Assam).

74. RICANIA FUMOSA, Walker.

Flatoides fumosa, Walker, List Hom. B. M. ii, p. 414 (1851).
Ricania fumosa, Stål, Ofvers. K. V.-A. Förh. p. 491 (1862).

♀. Body dark ferruginous ; frons and legs ferruginous : mesonotum piceous : tegmina blackish brown, veins black : wings brown. Body long, 3¼ ; teg., 12½ millims.

Locality not reported : the Indian Museum possesses a specimen from Assam ?

75. RICANIA APICALIS, Walker.

Pochazia apicalis, Walker, List Hom. B. M. ii, p. 431 (1851).
Ricania apicalis, Stål, Ofvers. K. V.-A. Förh. p. 491 (1852).

♀. Body testaceous : mesonotum black : legs testaceous : tegmina dull fawn-colour, ample, finely pubescent, with two indistinct pale brown oblique bands, the first forming a ringlet ; a black dot by the tip of the fore-border, veins tawny : wings pale grey, pale brown along the hind border. Body long, 5¼ ; teg., 16½ millims.

Locality not reported : the Indian Museum possesses specimens fairly agreeing with the description from Sikkim.

76. RICANIA OCELLUS, Walker.

Pochazia ocellus, Walker, List Hom. B. M. ii, p. 429 (1851).
Flatoides facialis, Walker, l. c. Suppt. p. 100 (1858).
Ricania ocellus, Stål, Ofvers. K. V.-A. Förh. p. 491 (1862).

♂, ♀. Body piceous : vertex and frons with a ferruginous rim : clypeus and rostrum tawny : abdomen ferruginous at the base and beneath: legs tawny: tegmina and wings colourless with brown borders, the former ample, a brown dot near the base, beyond it two slender brown bands; the first forming a brown ringlet on the disc between which and the border it is widened and includes a colourless dot; the second very slight extending along the outer band of transverse veins; veins tawny, here and there brown: stigma tawny: wings with a brown exterior border. Body long, 5—6½; teg., 17—19 millims.

Reported from China: the Indian Museum has a specimen from Assam.

77. RICANIA INTERRUPTA, Walker.

Pochazia interrupta, Walker, List Hom. B. M. ii, p. 428 (1851): nec *P. interrupta*, J. L. S. Zool. i, p. 91 (1856).

Ricania interrupta, Stål, Ofvers. K. V.-A. Förh. p. 491 (1862).

♀. Body black: head very short, as broad as the thorax; vertex very short, dark ferruginous, bordered by a rim, sinuate on the posterior border, nearly straight in front, its length in the middle about half of that on each side; frons very finely striated, rounded on each side, rather narrower towards the clypeus, bordered by a ferruginous rim, slightly concave where it joins the clypeus, tricarinate, the lateral ridges indistinct, its breadth a little less than twice its length; clypeus ferruginous, triangular, with a slight median ridge; pronotum very slightly sinuated behind, rounded anteriorly with a median ridge, on each side of which there is an impression, its length in the middle less than twice that on each side: mesonotum very finely striated, 5-carinate, the two ridges on each side united on the disc: abdomen dark ferruginous, obconical, a little longer than the thorax: legs ferruginous: tegmina dark brown, ample, triangular, with a broad, oblique white band which is interrupted in front; a row of white dots extending on the edge of the tegmen from the hind border along one-third of the distance to the tip; veins blackish, pale yellow on the white parts; longitudinal veins very numerous; transverse veins few; fore-border straight, along it a row of mostly parallel transverse veins which are more oblique where the longitudinal vein appears contorted, beyond this they are shorter: wings brown, little more than half the length of the tegmina with a white band which forms one with that on the tegmina (*Walker*). Body long, 6½; teg., 25 millims.

Reported from Malabar.

78. RICANIA SIMULANS, Walker.

Pochazia simulans, Walker, List Hom. B. M. ii, p. 431 (1851).

Ricania simulans, Stål, Ofvers. K. V.-A. Förh. p. 491 (1862).

♀. Body ferruginous: head as broad as the thorax; vertex very short, posteriorly sinuate, very slightly rounded in front, shorter in the middle than on each side; frons flat, rounded on each side, narrower towards the clypeus, bordered by a rim, concave where it joins the clypeus, not ridged, its breadth nearly twice its length: clypeus triangular: pronotum very short, arched, bordered by a rim: mesonotum black, not ridged: metanotum tawny: abdomen obconical, tawny at the base, hardly longer than the thorax: legs tawny: tegmina brown, ample, a tawny triangular spot on the anterior margin beyond the middle; two broad, oblique, very irregular, colourless bands on the disc, first short, second interrupted; veins tawny, longitudinal veins numerous, transverse veins few; anterior margin slightly convex, along it a row of parallel transverse veins which are contorted and more oblique towards the tip: wings pale greyish-brown (*Walker*). Body long, 5$\frac{1}{4}$; teg., 16$\frac{1}{2}$ millims.

Reported from N. India.

79. RICANIA PROMINENS, Walker.

Ricania prominens, Walker, Ins. Saund. Hom. p. 48 (1858).

Dull testaceous: head with eye and antennæ forming a large vertical compartment; vertex transverse, very short, mostly covered by the pronotum; frons with transverse blackish marks, very much longer than broad, with elevated borders and three slight ridges, the middle one abbreviated, the pair converging towards the face, where they are connected; face lanceolate, ridged: pronotum bicarinate, very convex along the fore border; mesonotum with a brown interlined disc and two blackish dots on each side; metanotum and abdomen dark brown, the latter with a pale testaceous stripe on each side: legs testaceous, femora slightly streaked with black: tegmina with brown marks along the costa and with a few brown marks elsewhere and with an irregular whitish subapical band; stigma whitish; veinlets regular along the costa and along the exterior border where they are mostly forked, the discal veins and veinlets irregular, the latter numerous; wings with very few veinlets; both vitreous grayish, veins black and the exterior borders brown (*Walker*). Body long, 8$\frac{1}{2}$; teg., 25 millims.

Reported from Silhat.

80. RICANIA GUTTIFERA, Walker.

Pochazia guttifera, Walker, List Hom. B. M. ii, p. 427 (1851).

Ricania guttifera, Stål, Ofvers. K. *V.*-A. Förh. p. 491 (1862); Distant, J. A. S. B. xlviii (2), p. 38 (1879).

♂, ♀. Body black: head very short, as broad as the thorax: vertex bordered with a rim, sinuate behind, straight in front, its length in the middle about half of that on each side: frons dark ferruginous with a black border, very finely striated, rounded on each side, narrower towards the clypeus, bordered by a rim, hardly sinuated where it joins the clypeus, having a middle ridge which does not reach the fore-border, its breadth nearly twice its length: clypeus triangular, with a middle ridge: pronotum slightly sinuate behind more rounded on the anterior margin, with a middle ridge much longer in the middle than on each side; mesonotum 5-carinate, the two ridges on each side united on the disc: abdomen obconical, a little longer than the thorax, ferruginous towards the base: legs ferruginous: tegmina triangular, ample, dark brown, blackish along the fore-border, with three colourless spots, one on the fore-border beyond the middle, one near the tip and one which is smaller near the hind border: a white dot on the disc and between it and the tip a small indistinct, tawny spot; veins blackish, tawny on the colourless spots, longitudinal veins very numerous towards the tips, transverse veins free; fore-border straight, along it a row of oblique, mostly parallel, transverse veins which are shorter towards the tip: wings dark brown, little more than half the length of the tegmina (*Walker*). Body long, 7—8½; teg., 29—36 millims.

Reported from Silhat (Assam).

Species doubtfully Indian.

81. RICANIA GUTTATA, Walker.

Flatoides guttatus, Walker, List Hom. B. M. ii, p. 408 (1856): J. L. S. Zool. i, p. 156 (1857).

Ricania guttata, Stål, Ofvers. K. V.-A. Förh. p. 491 (1862).

♂. Black: vertex piceous, frons dark ferruginous: pronotum ferruginous: legs tawny, femora piceous: tegmina blackish-brown, with three whitish-hyaline spots, one on the disc round, second larger and almost triangular placed on the costal margin near the tip, third as large as the first placed on the tip near the costal margin; a row of colourless dots along the tips of the tegmina; veins blackish, pale on the spots. Body long, 6¼; teg., 21 millims.

Reported from Hong Kong, Borneo.

82. RICANIA EPISCOPUS, Walker.

Flatoides episcopus, Walker, List Hom. B. M. Suppl. p. 100 (1858).

Ricania episcopus, Stål, Ofvers. K. V.-A. Förh., p. 491 (1862).

Tawny, testaceous beneath: abdomen luteous: tegmina and wings whitish; the tegmina with three broad blackish bands which are connected in front, the first and second connected in the middle; the three more or less connected with, or interrupted by three chalybeous black bands, of which the first is costal, the second is curved and contained in the fore-part of the second blackish band, and the third is marginal: a deep black spot half enclosed in the second chalybeous band: the wings with a broad median lurid band and a blackish marginal band. Body long, 8½-9½; teg., 21-23 millims.

Reported from N. China.

83. RICANIA OBLIQUA, Walker.

Pochazia obliqua, Walker, List Hom. B. M. ii, p. 429 (1851).
Ricania obliqua, Stål, Ofvers. K. V.-A. Fôrh., 591 (1862).

♂. Body black: frons dark ferruginous: legs ferruginous: tegmina brown, ferruginous towards the base (the costal margin excepted), with two slightly tawny bands, the outer one of irregular breadth, the inner one shorter and broader, and between them on the costal margin is a slightly tawny nearly triangular spot; veins concolorous: the wings are very slightly tinged with tawny, brown along the fore-borders. Body long, 6—7¼; teg., 19—21 millims.

84. RICANIA MARGINALIS, Walker.

Flatoides marginalis, Walker, List Hom. B. M. ii, p. 409 (1851): J. Linn. Soc. Zool. i. p. 89 (1856).
Ricania marginalis, Stål, Ofvers. K. V.-A. Förh. p. 491 (1862).

♀. Body black: abdomen and legs ferruginous: femora piceous: tegmina and wings blackish-brown, the former with five colourless spots of which one is a dot on the disc, second very large, triangular, on the costal margin near the tip, third much smaller on the tip, with 2—3 colourless dots, fourth and fifth small irregular, on the tip near the hind border; a row of colourless dots along the tips of the tegmina; veins blackish, pale on the spots. Body long, 7¼; teg., 25 millims.

Reported from Singapore, Africa (?).

85. RICANIA WALKERI.

Pochazia interrupta (n. b. l.), Walker, J. Linn. Soc. Zool. i, p. 91 (1856).

Testaceous: tegmina and wings brown, the former partly lurid towards the hind border, an interrupted band beyond the middle, tips hyaline, slightly testaceous. Vertex much broader than long; frons elongate subquadrate, with a slight groove in the middle: pronotum arched, extending over part of the vertex: mesonotum slightly tricarinate (*Walker*). Body long, 6¼; teg., 14½ millims.

Reported from Singapore.

86. RICANIA COSTIMACULA, Walker.

Pochazia costimacula, Walker, J. Linn. Soc. Zool. i, p. 91 (1856).

Black: head and legs tawny; vertex brown with a tawny border: tegmina and wings blackish, the former mostly lurid along the borders and about the transverse veinlets and with a whitish hyaline spot on the costa beyond the middle. Frons broader than long with a median ridge and an elevated margin (*Walker*). Body long, 5; teg., 14½ millims.

Reported from Malacca.

87. RICANIA GRADIENS, Walker.

Pochazia gradiens, Walker, J. Linn. Soc. Zool. i, p. 91 (1856).

Tawny, testaceous beneath: tegmina and wings blackish, the former tawny along the costa. Head with a median ridge and with the margins elevated: frons hardly broader than long, the sides rounded (*Walker*). Body long, 5; teg., 12½ millims.

Reported from Singapore.

88. RICANIA PLEBEIA, Stål.

Ricania plebeia, Stål, Ofvers. K. V.-A. Förh. p. 162 (1865).

♀. Fuscous-greyish; beneath with frons and feet, paler; tegmina fuscous, sprinkled with minute pale dots before the middle; a small obliquely transverse median line on the costal limbus whitish, and a very minute punctiform spot on the apical costal angle, black: wings infuscate. Frons tricarinate: commissural apical angle of the tegmina straight, apical margin almost entirely straight (*Stål*). Long, 7; exp. teg., 22 millims.

Reported from Siam.

89. RICANIA LIMITARIS, Stål.

Ricania limitaris, Stål, Ofvers. K. V.-A. Förh. p. 161 (1865).

Fuscous-testaceous, frons and feet paler: tegmina fuscous, clavus and indeterminate interior part of the corium, paler; a largish costal spot placed almost behind the middle, sordid whitish; a small shining spot in the costal apical angle, blackish, and a small obsolete discoidal spot, fuscous: wings very slightly infuscate. Frons obsoletely tricarinate, costal limbus of tegmina remotely transversely veined (*Stål*). Long, 8; exp. teg., 22 millims.

Reported from Cambodia.

90. RICANIA PULVEROSA, Stål.

Ricania pulverosa, Stål, Ofvers. K. V.-A. Förh. p. 162 (1865).

♂, ♀. Fuscous-testaceous; vertex, thorax, and scutellum, black: the basal part of the tegmina powdery-flavescent and the disc clouded fuscous; the transverse discoidal veinlets and the costal margin before the middle, pale; the latter minutely spotted fuscous; three costal spots, the median somewhat large, a small one near the apex, and a very minute apical one, yellow-whitish; the median costal spot with black transverse lines; a minute spot in the apical costal angle, black: wings weak fuscescent. Frons distinctly tricarinate: tegmina densely veined, the transverse veinlets on the costal limbus remote (*Stål*). Long, 4—7; exp. teg., 14—20 millims.

Reported from Cambodia.

91. RICANIA EPISCOPALIS, Stål.

Ricania episcopalis, Stål, Ofvers. K. V.-A. Förh. p. 162 (1865).

♀. Weak fuscous-testaceous: tegmina more obscure, costal spot behind the middle also two bands, one placed before the middle and abbreviated outwards, the other placed behind the middle and abbreviated near the costal margin, somewhat interrupted in the middle and produced a little forwards anteriorly, whitish hyaline; a spot near the costal margin behind the middle and an arch placed between the spot and the margin, black; wings very slightly infuscate, the base and a transverse spot behind the middle, whitish. Frons with a median obsolete ridge, lateral ridges very obsolete: tegmina densely veined, very numerous transverse veinlets on the costal limbus, several of which are forked (*Stål*). Long, 7; exp. teg., 21 millims.

Reported from N. China, Formosa.

Genus MINDURA, Stål.

Rio Jan. Hém. ii, p. 69 (1862).

In Hem. Afric. iv, p. 220 (1866), Stål unites the genera *Mindura* and *Miriza* with *Nogodina*, but subsequently [Ofvers. K. V.-A. Förh., p. 769 (1870)] keeps them separate and creates from *Miriza* the subgenera *Varcia* and *Sassula*, to the latter of which *M. sorurcula*, Stål, belongs.

Frons with two distinct ridges, slightly converging towards the apex, much longer than broad; vertex distinctly prominulous before the eyes; lateral margins of the clypeus carinate at least at the base: tegmina equally broad, broadly rounded at the apex, furnished between the apex of the clavus and the transversely veined costal area with a continued row of distinct transverse veinlets, the costal area of the usual breadth; interior vein of corium forked before the middle.

A. Tegmina vitreous; the first and second longitudinal veins emitted from the basal area not forked before the transverse row of veinlets mentioned above, transverse veins rare, very rare and obsolete before the row above mentioned; transverse veins on the apical part forming two rows, before which irregularly scattered transverse veins are present; last pair of tibiæ 3-spinose.—MIRIZA, Stål, of which the type is *Ricania bohemani*, Stål.

B. Tegmina opaque, with somewhat closely arranged transverse veinlets; the second longitudinal vein emitted from the basal area forked before the continued transverse row of veinlets; numerous transverse veinlets irregularly arranged on the apical part: last pair of tibiæ, 4-spinose.—MINDURA, Stål, of which the type is *Flata obscura*, Fabricius.

92. MIRIZA SORURCULA, Stål.

Miriza sorurcula, Stål, Ofvers. K. V.-A. Förh. p. 164 (1865); p. 769 (1870).

♂. Weak testaceous-flavescent: tegmina and wings sordid hyaline: extreme part of the lateral margins of the frons and clypeus, median ridge on the frons, two spots on the vertex and thorax, three lateral spots on the scutellum, the clavus except the basal part, irregular marginal spots on the corium which are more or less confluent, apical limbus of the wings, lateral margins and abbreviated bands on the dorsum of the abdomen, fuscous: disc of the scutellum more obscure (*Stål*). Long, 11; exp. teg., 30 millims.

Reported from Cambodia.

93. MINDURA HEMEROBII, Walker.

Ricania hemerobii, Walker, List Hom. B. M. ii, p. 425 (1851); J. Linn. Soc. Zool. i, p. 89 (1856).

Mindura hemerobii, Stål, Ofvers. K. V.-A. Förh. p. 491 (1862).

♂, ♀. Body tawny: frons dotted with brown, bordered by a black-edged rim; clypeus with a median ridge and border, black: mesonotum ferruginous with a tawny median stripe and two oblique black and slightly undulating ridges: abdomen with a black stripe above: legs tawny, striped black: tegmina and wings nearly colourless, the former with the tips and five spots, brown; of the latter two are placed near the tips towards the hind border, one near the tip on the fore-border and two are by the stigma which is tawny; veins black: wings edged with brown. Body long, $8\frac{1}{2}$; teg., 27 millims.

Reported from Ceylon, Malacca.

Genus PUCINA, Stål.

Hem. Afric. iv, p. 221 (1866), Berlin Ent. Zeitschr. x, p. 393 (1866).

Clavus without transverse veinlets: head not prominent before the eyes; vertex transverse; clypeus convex, without lateral ridges: tegmina gradually slightly amplified towards the apex, furnished towards the apex with oblong areolas arranged in two rows and with many areolas less regularly arranged on the disc; ulnar veins and radial forked somewhat before the middle of the corium; first tibiæ hardly longer than the femora and trochanters, last tibiæ bi-spinose (*Stål*).

94. PUCINA PELLUCIDA, Guérin.

Cixius pellucidus, Guérin, Voy. La Coquille, Zool. ii, (2), p. 189 (1830): Icon. Règne Animal, t. 58, f. 4 (1830-34).

Ricania pellucida, Spin., A. S. E. F. (1 sér.) viii, p. 401 (1839); Walker, List Hom. B. M. ii, p. 423 (1851).

Pucina pellucida, Stål, Berlin Ent. Zeitschr. x, p. 393 (1866).

Head yellowish with three ridges: frons thrice longer than broad, strongly margined and with a median ridge; vertex broader than long, disc flat and horizontal, margins elevated, fine; anterior margin obtusely angular, its tip extended a little beyond the eyes; posterior margin angularly emarginate: thorax varied with green and brown, also the abdomen, which is less high than broad: tegmina and wings transparent, veins brown, with a brown triangular dot on the anterior margin of each tegmen and near its tip; radial vein weakly arcuate, sub-radial straight, rejoining the radial towards the second third on the anterior margin, the intermediate space with eight transverse, sub-parallel veins and divided into nine fairly large cellules, of which the seven intermediate are as broad as long, the two extreme longer than broad; the adjoining space between the radial and cubital veins divided into two large, narrow, elongate cellules by a complete, transverse vein: feet yellowish, tarsi brown; posterior tibiæ with two lateral spines. Long, 6; exp. teg., 16 millims.

Reported from Java, Bengal.

Subfam. FLATINA, Stål.

Flatida, Hem. Afric. iv, pp. 131, 235 (1866); *Flatina*, Ofvers. K. V.-A. Förh. p. 771 (1870).

Clavus granulate, apex sometimes subacute and closed, sometimes very obtuse and broadly open; with two veins separated through the entire length or near the apex united in one; costa dilated, costal membrane transversely veined; claval suture distinct; anal area of wings not reticulated: last tibiæ without a mobile spur (*Stål*).

Genus CERYNIA, Stål.

Rio Jan. Hem. ii, p. 68 (1862) ; Hem. Afric., p. 235 (1866).

First joint of antennæ oblong or elongate, hardly shorter than the second ; genæ anteriorly rounded ; frons longitudinally convex : thorax produced in the middle and covering the short vertex ; tegmina very greatly decumbent, very ample ; posterior tibiæ very often bi-spinose : costal membrane narrowed at the base (*Stål*).

95. CERYNIA MARIA, White.

Pœciloptera maria, White, A. M. N. H. xviii, p. 25, t. 1, f. 3 (1846).

Flata maria, Walker, List Hom. B. M. ii, p. 436 (1851).

Cerynia maria, Stål, Ofvers. K. V.-A. Förh. p. 490 (1862) ; Distant, J. A. S. Ben. xlviii (2), p. 38 (1879) ; A. M. N. H. (5 sér.) xi, p. 172 (1883).

Of a very delicate white colour with a reddish wax-like spot not far from the base of the tegmina, an interrupted somewhat curved narrow black line running across the wing not reaching the fore-margin : behind it, and not far from the end of the inner margin there is a short narrow black line : the tegmina more or less powdered with a waxy secretion ; the wings white, somewhat hyaline : head, thorax, body and femora very pale yellow ; antennæ and tibiæ blackish : a large tuft of white, waxy, spongeous matter at the end of the body. In some specimens the red mark on the tegmina is nearly obsolete and the transverse black line is quite obsolete anteriorly (*White*). Exp. teg., 33—34 millims.

Var. *a*. *Flata tenella*, Walker, *l. c. supra*, p. 437 (1851), has the tegmina of a very delicate pale-green, abdomen in ♂ concolorous and in ♀ pale yellow.

Var. *b*. *Cerynia rosea*, mihi, has the tegmina of a delicate pale rose colour and comes from Sikkim.

Reported from India, Assam, Tenasserim. The Indian Museum possesses specimens from Sikkim, Assam, Tenasserim.

Genus PHROMNIA, Stål.

Rio Jan. Hem. ii, p. 68 (1862) ; Hem. Afric. iv, pp. 235, 239 (1866) : *Flata*, pt., Am. & Serv., Hist. Nat. Ins. Hém. p. 521 (1843).

Body oblong, compressed : head much narrower than the thorax ; vertex short, thorax concealed ; frons longitudinally convex, seen from the side roundly-prominulous ; genæ anteriorly rounded ; clypeus long : no ocelli : antennæ elongate, rounded, second joint twice or half longer than first : disc of thorax elevated behind the vertex, the elevated part somewhat sloped forwards, produced, covering the vertex : scutellum convex : tegmina very ample, very greatly decumbent, longer by half than broad, rounded at the apex, very densely longitudinally veined, few transverse veinlets on the disc, furnished near the apex with a regular row of transverse veinlets, costal membrane everywhere equally broad ; costal area furnished with obliquely transverse, forked, veins : feet moderate, simple ; last tibiæ very often bispinose (*Stål*).

96. PHROMNIA MARGINELLA, Olivier.

Fulgora marginella, Olivier, Enc. Méth. vi, pp. 566, 575 (1791) : Stoll, p. 50, t. 11, f. 54 (1788).

Flata marginella, Walker, List Hom. B. M. ii, p. 434 (1851) ; excl. syn.

Phromnia marginella, Stål, Ofvers. K. V.-A. Förh. p. 490 (1862) ; Distant, A. M. N. H. (5 sér.) xi, p. 171 (1883).

Body and feet greenish : apical joints of antennæ brown : tegmina bright green ; at the base itself with an orange-patch (at least in old specimens) costal margin up to apical fifth narrowly sanguineous, bordered interiorly with verdigris green, longitudinal veins slightly orange towards the base : wings white, transparent. Body long, 13 ; teg. long, 24 millims.

Reported from Ceylon, Mergui ; the Indian Museum has a series from Sikkim, Assam.

97. PHROMNIA TRICOLOR, White.

Pœciloptera (Flatida) tricolor, White, A. M. N. H. xviii, p. 26 (1846).

Flata tricolor, Walker, List Hom. B. M. ii, p. 435 (1851).

Phromnia tricolor, Stål, Ofvers. K. V.-A. Förh. p. 490 (1862) : Distant, A. M. N. H. (5 sér.) xi, p. 172 (1883).

Tegmina pale-green, anterior margin (especially at the base) reddish, the colour gradually verging into green ; a few white powdery dots on the basal part, the underside washed white : wings white, somewhat powdered ; veins, especially at the base, greenish : body and legs pale-green. The front edge of the wings near the base has a prominent angle, followed by a sinuation (*White*). Exp. teg. about 48 millims.

Reported from Silhat : the Indian Museum possesses specimens from Siam, Samaguting and Naga hills in one of which the green of the tegmina has faded to orange-yellow and in others the red is far advanced towards the middle and in others wanting.

98. PHROMNIA RUBICUNDA, Distant.

Phromnia rubicunda, Distant, A. M. N. H. (5 sér.) xi, p. 171 (1883).

Tegmina dull reddish, becoming slightly paler towards the apex ; the basal, marginal and apical areas above somewhat irregularly tinged and spotted with chalky white; beneath more evenly and palely tinged with the same colour: wings white: body pale ochraceous, the pronotum somewhat darker in hue: legs pale ochraceous, first and intermediate tibiæ and tarsi, black; last tarsi with the apical joint, black: tibiæ strongly sulcated, last tarsi armed with three prominent spines. Allied to *P. tricolor*, White, but differs in the longer tegmina and different colour of the same, different colour of tibiæ, &c. (*Distant*). Exp. teg., 62 millims.

Reported from Mergui.

99. PHROMNIA INTACTA, Walker.

Flata intacta, Walker, List Hom. B. M. ii, p. 435 (1851).
Phromnia intacta, Stål, Ofvers. K. V.-A. Förh. p. 490 (1862).

♀. Body pale stramineous: antennæ long, stramineous, third joint black, much longer than the second: pronotum almost truncate-conical on the disc, somewhat impressed in front, tricarinate, ridges produced through the mesonotum: abdomen obconical, not longer than the thorax: legs tawny; anterior tarsi and tips of the anterior tibiæ and of the hind tarsi, black: tegmina dingy white, veins white: wings milk-white. Body long, 9½; teg., 46 millims.

Reported from Silhat.

100. PHROMNIA INORNATA, Walker.

Flata inornata, Walker, List Hom. B. M. ii, p. 438 (1851).
Phromnia inornata, Stål, Ofvers. K. V.-A. Förh. p. 490 (1862).

Body tawny: antennæ black, very long, tawny towards the base: pronotum straight behind, conical in front, its length about one-fourth its breadth; mesonotum indistinctly tricarinate, disc flat: abdomen obconical, a little longer than the thorax: legs tawny, feet and tips of the anterior tibiæ, black: tegmina dull pale tawny, veins yellow: wings colourless. Body long, 12½; teg., 42 millims.

Reported from Tenasserim.

Genus LECHÆA, Stål.

Hem. Afric. iv, p. 236 (1866).

Tegmina furnished towards the apex with one or two rows of transverse veinlets or with veinlets irregularly scattered throughout, and with very many or several longitudinal veins forked at the apex, the longitudinal veins at the apex rarely simple, if so, the tegmina are furnished with a single row of veinlets near the apex. Body cylindrical or compressed; tegmina very greatly decumbent. Frons seen from the side and genæ produced in the middle; tegmina very ample, gradually somewhat amplified towards the apex, furnished near the apex with a regular arched row of transverse veinlets which begins behind the apex of the clavus, costal area transversely veined, some veins anastomosed (*Stål*). Type, *L. dentifrons*, Guérin.

101. LECHÆA DENTIFRONS, Guérin.

Pœciloptera dentifrons, Guérin, Icon. Règne Animal, Texte, p. 360 (1830-34). Walker, List Hom. B. M. ii, p. 445 (1851).

Lechæa dentifrons, Stål, Berlin Ent. Zeitschr. x, p. 393 (1866).

Genus SCARPANTA, Stål.

Hem. Afric iv, pp. 236, 240 (1866).

Body oblong, compressed: head much narrower than the thorax, vertex very short, concealed by the thorax: antennæ very short, first joint hardly visible: ocelli distinct: thorax compressly-elevated on the disc, elevated part flat, a little sloped forwards, anteriorly truncated, produced, covering the vertex, on both sides acutely margined or terminated by a ridge reaching the base: scutellum tricarinate: tegmina very ample; very greatly decumbent; gradually amplified beyond the middle; truncated at the apex, remotely veined; furnished throughout with transverse veinlets irregularly scattered, remote; costal area broad, remotely reticulate: the elevated dorsal part of the abdomen emitting a slender, erect, process: feet moderate, simple: last tibiæ bispinose (*Stål*).

102. SCARPANTA COMMA, Walker.

Pœciloptera comma, Walker, List Hom. B. M. ii, p. 447 (1851).

Scarpanta comma, Stål, Ofvers. K. V.-A. Förh. p. 490 (1862).

♂. Body buff: abdomen powdered with white, valves and other appendages at the tip large: legs tawny: anterior feet and tips of the anterior tibiæ and of the hind feet, black: tegmina buff, a very short and slender, slightly oblique, black streak on the disc, an oblong black dot near the hind border at one-third of the length from the base; veins buff: wings milk white. Body long, 9½; teg., 37½ millims.

Reported from Silhat.

Genus FLATA, Fabricius, Stål.

Ent. Syst. Suppt. pp. 511, 517 (1798); Stål, Berlin Ent. Zeitschr. vi, p. 313 (1862); Hem. Afric. iv, pp. 236, 241 (1866).

It includes *Colobesthes*, Am. & Serv., Hist. Nat. Ins. Hém., p. 522 (1843); *Cromna*, Walker, J. Linn. Soc. Zool. i, p. 85 (1856); and *Phyllyphanta*, Am. & Serv., l. c., p. 523 (1843).

Body oblong, compressed: head narrower than the thorax, varying in shape; vertex short, concealed; frons sometimes tumid or conically produced at the base: ocelli distinct: antennæ very short: thorax anteriorly somewhat produced, covering the vertex: scutellum more or less distinctly tricarinate: tegmina very ample, very greatly decumbent gradually amplified towards the apex, truncated at the apex, moderately densely veined, most, often all, the transverse veinlets irregularly scattered, veinlets rarely arranged in one or two irregular rows towards the apex, costal area irregularly reticulated: feet simple, last tibiæ bispinose (*Stål*). Type, ***Flata ocellata***, Fabr.

103. FLATA OCELLATA, Fabricius.

Cicada ocellata, Fabr., Syst. Ent. p. 682 (1775); Spec. Ins. ii, p. 322 (1781); Mant. Ins. ii, p. 268 (1787); Ent. Syst. iv, p. 27 (1794), excl. syn. de Géer.

Flata ocellata, Fabr., Ent. Syst. Suppt., p. 517 (1798); Syst. Rhyng., p. 49 (1803), Stål, Ofvers. K. V.-A. Förh. p. 489 (1862); Hem. Fabr. ii, p. 107 (1869).

Ricania ocellata, Germar, Mag. Ent. iii, p. 224 (1818).

Pœciloptera ocellata, Burm., Handb. Ent. ii (i), p. 162 (1835); Spin., A. S. E. F. viii, p. 441 (1839); Walker, List Hom. B. M. ii, pp. 444, 454 (1851).

Pœciloptera stellaris, Walker, List l. c. ii, p. 453 (1851).

Pœciloptera argiolus, Stål, Ofvers. K. V.-A. Förh. p. 191 (1855).

Green: tegmina much compressed, posteriorly acutely angulated, green, sprinkled with numerous ocellar ferruginous dots: feet pallid (*Fabr.*). In faded specimens the colour is a dirty white or yellow and the ferruginous spots become an obscure brown.

Stål's *P. argiolus* is thus described:—'Weakly whitish-virescent; frons, thorax, and scutellum tricarinate, the last, however, less so: tegmina sparingly sprinkled with small dull black-sanguineous spots, obsoletely circled whitish; clavus granulate.' Body long, 6; exp. teg., 20 millims.

Reported from Tranquebar.

104. FLATA FERRUGATA, Fabricius.

Flata ferrugata, Fabr., Syst. Rhyng. p. 50 (1803); Germar in Thon's Archiv. ii, fasc. 2, p. 49 (1830); Stål, Hem. Fabr. ii, p. 108 (1869).

♀. Very palely subtestaceous-flavescent, here and there covered with a whitish powdery substance; wings whitish: apical margins of the two last segments of the abdomen in ♀ at least, black towards the sides. Very close to *F. ocellata*, Fabr., hardly differs except in coloration unless in having the apical, commissural angle of the tegmina a little less produced, somewhat straight, not distinctly acute and thorax with a single less distinct median ridge. Head truncate, vertex very obtusely angulated anteriorly, concealed by the thorax; frons a little longer than it is broad beneath the middle, gradually slightly amplified from the base beyond the middle, thence on both sides obtusely rounded furnished with an obtuse median ridge running through it, slightly impressed on both sides within the lateral margins, not tumescent at the base: thorax with a median ridge (*Stål*). Body long, 8; with teg., 10½; exp. teg., 24 millims.

Reported from Tranquebar.

105. FLATA MARGINELLA, Guérin.

Ricania marginella, Guérin, Voy. La Coquille Zool. ii (2), p. 192 (1830); Icon. Règne Animal Ins., t. 58, f. 6 (1830-34); Voy. Bélanger Ind. Orient. p. 467 (1834.)

Pœciloptera marginella, Spin., A. S. E. F. (1 sér.) viii, p. 433 (1839); Walker, List Hom. B. M. ii, p. 443 (1851).

Nephesa marginella, Walker, J. Linn. S. Zool. i, p. 161 (1857).

Pœciloptera fimbriolata, Stål, Ofvers. K. V.-A. Forh. p. 247 (1854).

Phyllyphanta fimbriolata, Stål, Freg. Eug. Resa, p. 282 (1859); Ofvers. l. c., p. 159 (1865).

Head greenish-yellow: frons elevated in a small, conical, somewhat projecting process: pro- and meso-notum, fresh green with four longitudinal lines converging towards the head, the two internal a little broader and more visible, also some patches on the sides, bright orange or miniaceous red: metanotum and abdomen yellowish-white mingled with some green tints: head beneath, four anterior tibiæ, and anus pale brown: entire body beneath, four anterior femora, and posterior feet very pale green: tegmina falciform, very fresh green, reticulated orange, outline bordered russet and dentate within, very slender at the side and external margin, broader on the posterior margin; towards the end of this margin, at the second third from the base, there is a small rounded russet patch touching the border and placed near the exterior dilated angle: wings milky-white with slightly greenish and bluish reflections: abdomen and feet greenish-white (*Guérin*). Long, 6; exp. teg., 19 millims.

Stål's description of his *P. fimbriolata*, which was clearly made from a faded specimen, is:—"Yellow, streak on vertex and thorax and entire limbus of tegmina, fuscous-sanguineous, disc of thorax with two luteous streaks; frons reflexly-margined, furnished on both sides with a very obsolete ridge towards the base, but towards the apex entirely evanescent; disc of thorax bicarinate; scutellum 4-carinate, with the lateral ridges abrupt behind the middle, somewhat flat between the median ridges; colour of tegmina changing into subvirescent, cellules margined lutescent, clavus granulate inwards; wings milk-white. ♀ long, 7; exp. teg., 20 millims."

Reported from Cochin-China, Malacca, Borneo; the Indian Museum possesses a specimen from Siam.

106. Flata intracta, Walker.

Pœciloptera intracta, Walker, List Hom. B. M. Suppt. p. 116 (1858).

Bright pale grass-green: frons hardly longer than broad, slightly tricarinate, margins not elevated, slightly widened towards the face: pro- and meso-notum slightly tricarinate, the former arched: abdomen pale testaceous: legs partly reddish: tegmina with a pale testaceous marginal line; costa rounded; tip and interior angle somewhat rounded, especially the former; the exterior border hardly rounded, interior border tuberculate; veins and transverse veinlets numerous: wings white. Body long, $6\frac{1}{4}$; teg., 19 millims.

Reported from the Punjab.

107. Flata flaccida, Walker.

Flata flaccida, Walker, Ins. Saund. Hom., p. 50 (1858).

Pale testaceous: vertex elongated, narrower towards the front, with elevated borders: antennæ black: thorax tricarinate: abdomen somewhat paler than the thorax: anterior tibiæ and anterior tarsi mostly piceous: tegmina with a few minute pustules, veins very numerous, especially along the margin: wings white (*Walker*). Body long, $12\frac{1}{2}$; teg., 50 millims.

Reported from India.

108. Flata indocilis, Walker.

Pœciloptera indocilis, Walker, Ins. Saund. Hom. p. 55 (1858).

♀. Testaceous: vertex covered by the pronotum; frons not longer than broad, widening a little towards the face, with a slightly elevated border, tricarinate; face lanceolate, ecarinate: pronotum transverse, distinctly carinate, conical in front, slightly concave behind: mesonotum ecarinate: abdomen and legs whitish testaceous: tegmina with numerous discal veins and transverse veinlets, slightly convex along the costa, rectangular, and hardly rounded at the tips, straight along the exterior border, interior angle acutely rectangular, marginal veinlets rather short, mostly forked along the exterior border: wings white (*Walker*). Body long, $6\frac{1}{4}$; teg., $16\frac{3}{4}$ millims.

Reported from India.

109. Flata angulifera, Walker.

Cromna angulifera, Walker, Ins. Saund. Hom. p. 57 (1858).

♀. Testaceous varied with green: head elongate, acutely conical; frons with elevated borders, ecarinate; face lanceolate: disc of thorax flat, slightly carinate on each side ; pronotum transverse, slightly arched : tegmina green, slightly testaceous along the interior border, with few veins and very few transverse veinlets on the disc, the marginal veinlets numerous, moderately long, costa convex for two-thirds of the length from the base, very slightly concave from thence to the tip which is rectangular like the interior angle, exterior border straight : wings white (*Walker*). Body long, 4¼ ; teg., 10½ millims.

Reported from India.

110. FLATA MARGINALIS, Signoret.

Phylliphanta marginalis, Signoret, A. S. E. F. (4 sér.) ii, p. 125 (1862).

Green-yellow, a little lighter beneath : tip of the head and outline of the tegmina yellowish-brown : wings whitish : head acuminate in front and covered almost entirely by the pronotum which is extended well beyond the eyes and allows only the cephalic prolongation of the head to be seen, then directed downwards it changes its contour or outline beyond the eyes by proceeding abruptly forwards in forming a right angle ; anterior margin rounded very convex, posterior margin concave : mesonotum very broad, convex, rounded in front, extremity rounded, median part flat, bounded by two complete ridges, on each side of which are two incomplete ridges which proceed from the anterior border. Lower angle of tegmina very acute, upper margin rounded, external angle rounded, external margin almost straight, sutural margin sinuate and rugose ; external cubital vein much elevated and furnished on each side with a number of small tubercles which as well as the vein are of a yellow brown : wings whitish : abdomen yellowish, genitalia brownish : feet yellow, anterior tibiæ, brownish (*Sign.*). Long, teg. extended, 18 millims.

Reported from Cochin-China.

111. FLATA FALCATA, Guérin.

Pœciloptera falcata, Guérin, Voy. Bélanger Ind. Orient. Zool., p. 469, t. 3, f. 6 (1834); Spin., A. S. E. F. viii, p. 430 (1839).

Colobesthes falcata, Am. & Serv., Hist. Nat. Ins. Hém., p. 523 (1843) ; Walker, List Hom. B. M. ii, p. 439 (1851) ;

Colobesthes albiplana, Walker, J. Linn. Soc. Zool. i, p. 92 (1856), p. 161 (1857) ; x, p. 180 (1867).

Entire body and feet pale golden-yellow ; head carinate on the sides, eyes black : thorax subcarinate : tegmina subtriangular, anterior margin rounded, very narrow at the base, external margin as large as the anterior margin, of a yellowish-white with an immense number of pale golden-yellow veinlets : wings milky white, semi-transparent, posteriorly dilated: abdomen compressed, yellowish; feet rather short, tarsi a little brunneous (*Guérin*). Long, 14; exp. 57 millims.

Reported from Borneo, Sumatra, Java, Singapore, Malacca, Burma.

Walker describes his *C. albiplana* thus:—"White: tegmina convex in front, rectangular at the tips, straight and quadrate from thence to the interior angle which is attenuated and very acute: posterior margin straight: wings hardly acuminate at the tips."

112. FLATA CONSPERSA, Walker.

Colobesthes conspersa, Walker, List Hom. B. M. ii, p. 440 (1851); Stål, Ofvers. K. V.-A. Förh. p. 490 (1862).

♂, ♀. Body tawny: head narrower than the thorax; vertex very short; frons conical above, fore-part paler: abdomen obconical, longer than the thorax, powdered with white: legs pale tawny: tegmina pale fawn-colour, sprinkled with black which is chiefly on the transverse veins, rounded on the anterior margin, truncate at a right angle along the tip, sinuate on the posterior margin at the tip of which they are produced into an acute angle or hook; veins pale tawny: wings milk-white. Body long, 11—15; teg., 38—46 millims.

Reported from India, Assam, Silhat: the Indian Museum possesses specimens from Sibságar, Sikkim, Calcutta.

113. FLATA ACUTIPENNIS, Walker.

Cromna acutipennis, Walker, J. Linn. Soc. Zool. i, p. 85 (1856).

Green, paler beneath: head and thorax with testaceous stripes; tegmina with a brown line extending from near the tip of the costa to one-third of the length of the hind border from the interior angle: wings white (*Walker*). Body long, 7¼; teg., 21 millims.

Reported from Malacca, Burma.

114. FLATA LUTESCENS, Walker.

Pœciloptera lutescens, Walker, List Hom. B. M. Suppt., p. 117 (1858).
Flata lutescens, Stål, Ofvers. K. V.-A. Förh. p. 490 (1862).

♂. Testaceous: vertex a little broader than long, indistinctly tricarinate, borders slightly elevated: pronotum arched, slightly unicarinate: mesonotum indistinctly tricarinate: dorsal apical appendage of abdomen long, slender, curved, sulcate: tegmina very slightly rounded along the costa; tip rounded; exterior border straight forming a well-defined right angle with the interior border which is tuberculate: veins and transverse veinlets rather numerous; marginal veinlets rather long: wings white (*Walker*). Body long, 6¼; teg., 19 millims.

Reported from N. India.

115. FLATA ALBATA, Stål.

Flata albata, Stål, Ofvers. K. V.-A. Förh. xi, p. 247 (1854): Freg. Eug. Resa, p. 283 (1859).

Whitish: tegmina within two fuscescent bands at the apex, behind the middle with three, small, oblique, abbreviated, black bands; geniculæ, tibiæ, and anterior tarsi, black-fuscous (*Stål*). Body long, 10; exp. teg., 33 millims.

Reported from Malacca.

116. FLATA MARGINATA, Walker.

Colobesthes marginata, Walker, J. Linn. Soc. Zool. i, p. 92 (1856).

Greenish-white: frons not broader than long, with a slightly elevated border and a slight ridge: sides slightly rounded: mesonotum on each side with a testaceous stripe which includes a luteous line: tegmina minutely tuberculate towards the base, rounded in front, rectangular at the tips, straight and quadrate from thence to the hind angle which is attenuated and acute: hind border straight, a pale luteous marginal band extending from three-fourths of the length of the costa nearly to the middle of the hind border (*Walker*). Body long, 8½; teg., 37½ millims.

Reported from Malacca, Burma.

117. FLATA PRYERI, Distant.

Flata (*Colobesthes*) *pryeri*, Distant, Trans. Ent. Soc., p. 153 (1880).

Body above and tegmina pale greenish; wings pale greenish white: tegmina with the costal, inner, and outer margins (the last only half the length from the apex) narrowly and obscurely luteous, and with an angular black line on the disc, about half way from the base and about two-thirds the distance from the costal margin: body beneath and legs somewhat luteous. Face broad, convex, carinate in the middle, sides amplified: posterior angle of tegmina attenuated and acute, expanse at outer margin twice that of width near base: two well developed transverse, somewhat irregular, series of veinlets preceding outer margin and a third one situated midway between these and the reticulated area (*Distant*). Body long, 10; exp. teg., 36 millims.

Reported from Borneo, Penang.

118. FLATA ANTICA, Walker.

Pœciloptera antica, Walker (*nec* Westw.), List Hom. B. M. ii, p. 456 (1851).
Flata antica, Stål, Ofvers. K. V.-A. Förh. p. 490 (1862).

♀. Body yellowish-green: head very short; vertex extremely short, apparently almost concealed by the pronotum; frons flat, a little broader towards the clypeus, pale luteous and slightly rounded on each side, margins reflexed, very slightly sinuate where it joins the clypeus with a median ridge extending three-fourths of its length: clypeus slightly rounded, obliquely streaked on both sides: mesonotum with three green stripes of which the median follows a ridge: pectus luteous; abdomen obconical, crested, pale green and tinged with white above: legs pale luteous: tegmina whitish green, dilated and tuberculated along more than half the length of the hind border, truncated at the tips which form right angles with the hind borders; veins bright luteous especially along the fore-border towards the base where the whole wing has that hue unless closely inspected: wings white. Body long, 9½; teg., 25 millims.

Reported from India.

Species of uncertain position.

119. FLATA COROMANDELICA, Spinola.

Pœciloptera coromandelica, Spin., A. S. E. F. (1 sér.) viii, p. 440 (1839); Walker, List Hom. B. M. ii, p. 440 (1851).

♂, ♀. Head, dorsum of thorax, tegmina, grass-green, the rest including wings of a lighter green, veins deeper: second joint of the antennæ, exterior border of the external flap, and of the entire discoidal space of the tegmina orange: third joint of the antennæ and its filament, spines on tibiæ and tarsi, black.

Reported from Coromandel.

120. FLATA TRUNCATA, Linnæus.

Cicada truncata, Linn., Syst. Nat. ii, p. 704 (1758); Amœn. Acad. vi, p. 399 (1763).

Fulgora truncata, Olivier, Enc. Méth. vi, p. 571 (1791); Fabricius, Syst. Ent. p. 674 (1775); Spec. Ins. ii, p. 315 (1781); Mant. Ins. ii, p. 261 (1787); Ent. Syst. iv, p. 4 (1794); Syst. Rhyng., p. 4 (1803).

Pœciloptera truncata, Westwood, Trans. Linn. Soc. xviii, p. 151 (1841); Walker, List Hom. B. M. ii, p. 446 (1851).

Whitish-green, wings deflexed, compressed, posteriorly truncated, frons a little advanced, obtuse. (*Linn.*)

Reported from India, Java.

121. FLATA ADDITA, Walker.

Pœciloptera addita, Walker, List Hom. B. M. ii, p. 448 (1851).

Pœciloptera plana, Walker, List l. c., p. 463 (1851).

Flata addita, Stål, Ofvers. K. V.-A. Förh. p. 489 (1862).

Walker makes his species the same as Stoll's ' La Cigale chappe verte (Cigales, p. 76, t. 19, f. 103), which comes from Madras. Stoll describes it as having head and eyes white, body and feet pale yellowish green, tegmina green, powdered with white farinose, wings white. Walker's *P. addita* has body pale green; antennæ yellow; abdomen greenish yellow powdered with white: legs pale green: feet tawny: tegmina pale green powdered with white; veins green: wings milk-white. Walker's *P. plana* is only a faded specimen of *P. addita*.

♂. Body long, 6—7; teg., 25—29 millims.

122. FLATA LACTIFERA, Walker.

Pœciloptera lactifera, Walker, List Hom. B. M. ii, p. 450 (1851).

Body, legs and veins on tegmina pale stramineous; the two former powdered with white: mesonotum with two luteous stripes; tegmina and wings white, tegmina with numerous longitudinal and few transverse veins, anterior margin slightly rounded and along it a row of oblique, parallel, here and there forked, transverse veins. Body long, 6¼; teg., 21 millims.

Reported from N. India.

123. FLATA DISTINCTISSIMA, Walker.

Pœciloptera distinctissima, Walker, List Hom. B. M. Suppt., p. 114 (1858).
Flata distinctissima, Stål, Ofvers. K. V.-A. Förh. p. 490 (1862).

Pale green or whitish or testaceous: mesonotum with four more or less distinct luteous or testaceous stripes: abdomen and legs pale testaceous: tegmina with a reddish marginal line extending from the apical part of the costa to the base of the interior border which is slightly tuberculate; veins and transverse veinlets, testaceous: wings white. Long, 7¼; teg., 21 millims.

Reported from N. China.

124. FLATA GUTTULARIS, Walker.

Pœciloptera guttularis, Walker, List Hom. B. M. Suppt., p. 111 (1858).
Flata guttularis, Stål, Ofvers. K. V.-A. Förh. p. 490 (1862).

Testaceous, whitish pubescent, rarely pale green: abdomen generally white: tegmina rarely tinged with green towards the base and along the costa, with about 18 minute black dots: wings white. Long, 9—10½; teg., 31—33 millims.

Reported from N. China.

125. FLATA (?) TRISCRIPTA, Walker.

Flata triscripta, Walker, Ins. Saund., p. 50 (1858.)

Green, thickly covered with white tomentum: antennæ, tarsi, and fore-tibiæ, black: wings white, iridescent: vertex and frons elongated, their borders elevated, parallel: pronotum much arched: tegmina with a slight green tinge, slightly testaceous along the borders and with two grayish, curved, parallel bands, the one marginal the other submarginal; three black discal lines of which the fore one forms a very obtuse angle, much longer than the other two, between which and the interior border the veins are black; costa and exterior border rounded; veins numerous; veinlets rather numerous (*Walker*). Body long, 8½; exp. teg., 25 millims.

Reported from Penang.

126. FLATA (?) RECTIMARGO, Walker.

Pœciloptera rectimargo, Walker, Ins. Saund., p. 51 (1858).

Testaceous with a very slight rosy tinge: abdomen whitish testaceous: tegmina very pale rosy; wings white. ♂ has fore tibiæ, black: tegmina with a luteous tinge along part of both exterior and interior borders. ♀ has the tegmina with a luteous stripe near the costa. Body long, 10½—12½; teg., 46—50 millims.

Reported from Penang.

127. FLATA SINENSIS, Walker.

Pœciloptera sinensis, Walker, List Hom. B. M. ii, p. 451 (1851).

Pœciloptera cereris, Stål, Ofvers. K. V.-A. Förh. p. 247 (1854).

Phyllyphanta cereris, Stål, Freg. Eug. Resa, Hem., p. 282 (1859); Ofvers. l. c., p. 489 (1862).

♂, ♀. Weak virescent: head briefly conically produced; frons reflexly margined with a very obsolete median ridge: thorax somewhat granulated towards the sides, with a slight ridge: scutellum parallel with three obsolete grass-green ridges, the lateral pair very obsolete: tegmina scarcely twice as long as broad, internal apical angle acutely produced; the exterior apical limbus and the internal limbus behind the middle densely adorned with small fuscous spots; clavus densely and external limbus towards the base sparingly, granulated; very many cells furnished with a weaker granule or somewhat elevated spot (*Stål*). Long, 9; exp. teg., 22 millims.

Reported from Hong-Kong.

Genus SELIZA, Stål.

Berlin Ent. Zeitschr. vi, p. 312 (1862).

Head narrower than the thorax; vertex transverse, concealed: frons of variable length, sometimes subtumid at the base, lateral margins somewhat acutish and slightly reflexed: obsolete ocelli present: antennæ short, first joint very short: thorax slightly arcuate, prominent in a small tooth anteriorly on both sides at the eyes; thorax and scutellum without ridges: tegmina moderately ample, contracted slightly near the apex, subtruncated at the apex, apical angles rounded, sprinkled irregularly with transverse veinlets, furnished between the apex of the clavus and of the subradial vein with a continued row of transverse veinlets, the space between the subradial vein and cubitus varying in length and breadth, and furnished towards the apex with transverse veinlets: veins on clavus united towards the apex: feet moderate, simple; last tibiæ bispinose behind the middle. Allied to *Flata*, Fabr., but very distinct in the structure and form of the tegmina (*Stål*): type, *P. vidua*, Stål.

128. SELIZA VIDUA, Stål.

Pœciloptera vidua, Stål, Ofvers. K. V.-A. Förh. xi, p. 248 (1854); Freg. Eug. Resa, Ins. p. 281 (1859).

Seliza vidua, Stål, Berlin Ent. Zeitschr. vi, p. 812 (1862).

Yellow-testaceous; frons furnished at the base with an arcuate ridge, and towards the base between the eyes with a longitudinal ridge: tegmina subparallel, one and a half times longer than the breadth, behind the middle both outwardly and inwardly sinuate, roundly truncated at the apex, adorned with a broad black-fuscous patch, clavus inwardly tuberculate. Head yellow testaceous, at the base itself with a subarcuate transverse ridge; frons somewhat longer than the breadth, reflexly-margined, furnished with a small ridge towards the base: antennæ flavescent, third joint fuscous: thorax yellow-testaceous, semicircularly subelevated behind the head: scutellum yellow-testaceous, convex, almost four times longer than the thorax: tegmina one and half times longer than the breadth, rounded outwardly from the base, then subparallel, sinuated outwardly and inwardly behind the middle, roundly truncate at the apex, testaceous-yellow; a large, longitudinal patch, abrupt before the middle, black fuscous; clavus longitudinally carinately elevated inwards: beneath with feet testaceous-yellow (*Stål*). Long, 5; exp. teg., 14 millims.

Reported from Malacca, India.

129. SELIZA TRUNCATA, Walker.

Flatoides truncatus, Walker, List Hom. B. M. ii, p. 419 (1851).

Seliza truncata, Stål, Ofvers. K. V.-A. Förh., p. 490 (1862).

♂. Body tawny, darker here and there: head a little narrower than the thorax; vertex conical, slightly concave; frons much larger than broad, widening from the vertex to the clypeus where it is rounded, reflexly marginate, and with a slight median ridge: eyes striped: thorax rounded in front slightly sinuate behind; nearly four times broader than long: mesonotum ferruginous, more than twice as long as the pronotum: abdomen luteous, obconical, not longer than the thorax: genitalia consisting of two curved appendages the tips of which cross each other; the lower one compressed, deep, grooved; the upper one longer and more slender: legs tawny: tegmina truncate at the tips, pale tawny: veins darker, very numerous towards the tips: wings almost colourless, brown towards the tips; veins brown, tawny at the base (*Walker*). Body long, 5; teg., 14½ millims.

Reported from N. India.

130. SELIZA FERRUGINEA, Walker.

Elidiptera ferruginea, Walker, List Hom. B. M. ii, p. 333 (1851).
Seliza ferruginea, Stål, K. V.-A. Förh., p. 490 (1862).

♂. Body tawny; head much narrower than the thorax; its two segments divided by a suture which forms an angle towards the hind border; hind segment yellow, piceous on the disc, its back forming a right angle with each side on which the eye is placed: fore segment piceous, rounded in front; frons rather broad, rounded on each side, piceous next the crown: rostrum tawny, reaching the hind coxæ: antennæ ferruginous, rather short, second joint nearly twice longer than the first: pronotum as long as the head very finely rugulose, somewhat truncated in front, slightly sinuate behind, disc of the mesonotum, piceous: abdomen obconical, not longer than the thorax: legs tawny, grooved, rather broad; a tooth on each hind tibia near the tip: tegmina ferruginous, darker at the tips, partly inflated at the base and along the hind border, near whose base there are a few rows of small tubercles; reticulated part occupying full one-third of the wing; fore-border slightly convex not dilated; a row of numerous short parallel veinlets between it and the first longitudinal vein; veins ferruginous: wings grayish (*Walker*). Body long, 6½; teg., 16½ millims.

Reported from India.

131. SELIZA LIGNARIA, Walker.

Flatoides lignarius, Walker, List Hom. B. M. ii, p. 413 (1851).
Flatoides minor, Walker, l. c., p. 417 (1851).
Flatoides dubitans, Walker, l. c., Suppt., p. 101 (1858).
Pœciloptera punctifrons, Walker, l. c., Suppt., p. 118 (1858).
Seliza lignaria, Stål, Ofvers. K. V.-A. Förh., p. 489 (1862).

♂. Body ferruginous: vertex with a large piceous spot on each side; frons and clypeus, tawny; mesonotum piceous: abdomen a little longer than the thorax, genitalia very long, upper one armed near the base with two spines, curved downwards towards the tip which approaches the middle of the tip of the lower one, the latter is very deep, especially at the tip where its depth is almost equal to its length: legs tawny: tegmina ferruginous, moderately broad, with a few darker spots; discs of the areolas almost colourless; veins brown; costal margin much dilated towards the base and along it a row of parallel transverse veins: wings gray, paler towards the base. ♀ has the abdomen shorter than the thorax, tip rounded and along it a groove with a transverse ridge. Body long, $5\frac{1}{4}$; teg., $16\frac{1}{2}$ millims.

Reported from Hong-Kong.

Genus FLATOIDES, Guérin.

Icon. Règne Animal, Texte, Ins., p. 362 (1838): Stål, Hem. Afric. iv, pp. 237, 248 (1866): includes *Phalænomorpha*, Am. & Serv. Hist. Nat. Ins. Hém., p. 525 (1843); Stål, Berlin Ent. Zeitschr. vi, p. 312 (1862).

Body oblong, depressed, head produced before the eyes; vertex flat, sides parallel, confused anteriorly with the produced base of the frons which is not ridged: rostrum rather long, antennæ short: thorax elevated and flat on the disc, broadly sinuate at the base, sides flattened: tegmina ample, suboblong, costal membrane broad: feet simple, last tibiæ bispinose; last dorsal segment of the abdomen in ♀ furnished with a large produced plate, rounded at the apex (*Stål*).

132. FLATOIDES INDICA, Walker.

Elidiptera indica, Walker, List Hom. B. M. ii, p. 330 (1851).
Flatoides indica, Stål, Ofvers. K. V.-A. Förh., p. 489 (1862).

♂. Body pale tawny, mottled with darker colour: head conical, not longer than the pronotum, somewhat sinuate and with a brown stripe above, yellow and marked with a darker colour beneath where it widens to the clypeus: rostrum luteous, reaching to the hind coxæ; eyes very prominent: antennæ luteous, rather long, second joint longer than the first; pronotum conical, slightly excavated and indistinctly angular on the hind border: disc of the mesonotum very concave; a ridge on each side towards the tip which forms an acute angle: abdomen slightly obconical, a little longer and broader than the thorax: legs pale tawny, slightly grooved: a single black-tipped spine on each hind tibia: tegmina very pale tawny, almost colourless towards the tips, adorned on the veins with numerous brown dots, some of which are confluent and with a transverse brown band at one-third from the base;

veins pale tawny; a broad convex membrane along the fore-border and at the tip slightly waved, furnished with numerous veins, most of which are connected by a band of transverse veins: wings whitish: veins pale stramineous (*Walker*). Body long, 10½; teg., 25 millims.

Reported from French rocks near Madras.

133. FLATOIDES FIMBRIA, Walker.

Elidiptera fimbria, Walker, List Hom. B. M. ii, p. 331 (1851).
Flatoides fimbria, Stål, Ofvers. K. V.-A. Förh., p. 489 (1862).

♀. Body pale dull luteous: head conical, a little longer than the pronotum; lateral margins slightly carinate; frons widest between the eyes: rostrum tawny, nearly reaching the hind coxæ: eyes not prominent: pronotum truncated in front, with a slight median ridge; hardly excavated on the hind border, paler than the head: mesonotum pale brown with two ridges which are oblique in front: abdomen elliptical, longer than the thorax, marked with black at the base: legs tawny, slightly grooved; a single black-tipped spine near the tip of each hind tibia: tegmina pale yellowish-brown with small irregular dark brown marks which are chiefly on the veins, rounded, much widened and furnished with numerous veins along the fore-border; veins pale tawny: wings pale gray, veins tawny (*Walker*). Body long, 10½; teg., 27 millims.

Reported from Silhat.

134. FLATOIDES PRINCIPALIS, Stål.

Flatoides principalis, Stål, Ofvers. K. V.-A. Förh., p. 159 (1865).

♀. Testaceous-stramineous, tegmina turning into pale olivaceous, very slightly narrowed behind the middle, broadly rounded at the apex: wings sordid whitish. Head fairly produced before the eyes; vertex somewhat longer than the thorax, a little longer than broad, obtuse at the apex and sinuated on both sides; frons much longer than broad, fairly narrowed upwards, rounded on both sides towards the apex; a ridge proceeding from the base beyond the middle, distinct, furnished in the middle with two small ridges: clypeus without a ridge: median part of the thorax, elevated, somewhat concave anteriorly, rounded at the apex: scutellum with an abbreviated transverse ridge a little before the middle, recurved on both sides, and continued to the apex, black-fuscous at the apex: costal part of the tegmina transversely veined, very broad, narrowed towards the apex, occupying towards the base more than a third part of the tegmina; margins entire, not eroded: last pair of tibiæ bispinose (*Stål*). Long, 15; exp. teg., 38 millims.

Reported from Malacca, Ligor.

135. FLATOIDES (?) EMARGINATUS, Walker.

Flatoides emarginatus, Walker, J. Linn. Soc. Zool. i, p. 89 (1856).

Blackish: head, pectus, and legs dull dark testaceous; frons about twice broader than long with an elevated border and with three short ridges on the hind part: tegmina and wings blackish, a white limpid spot beyond the middle of the costa of the tegmina, which are slightly hooked. Body long, 6½; exp. teg., 23 millims.

Reported from Singapore.

Genus ATRACIS, Stål.

Hem. Afric. iv, pp. 237, 250 (1866).

Body oblong, depressed: head much narrower than the thorax, more or less prominulous before the eyes: ocelli present: antennæ short: disc of thorax elevated and flat; thorax broadly sinuated at the base: clavus granulated at the base: last segment of the abdomen in ♀ produced in a large plate which is rounded at the apex: feet simple, last tibiæ unispinose (*Stål*).

136. ATRACIS PRUINOSA, Walker.

Elidiptera pruinosa, Walker, List Hom. B. M. Suppt., p. 75 (1858).
Flatoides pruinosa, Stål, Ofvers. K. V.-A. Förh., p. 439 (1862).
Atracis pruinosa, Stal, Hem. Afric. iv, p. 250 (1866).

Sordid testaceous: head and pronotum slightly marked with black: disc of the mesonotum mostly black: tegmina with a slight greyish bloom and slight, small, irregular and variable, brown or black marks; costal margin much dilated: wings greyish with darker veins. Vertex much broader than long, slightly angular in front, with a slight ridge and with elevated borders; frons a little longer than broad, with two nearly obsolete ridges and with slightly elevated borders; pronotum somewhat truncated anteriorly and with a very slight ridge (*Walker*). Body long, 7½; teg., 21 millims.

Reported from N. China.

Genus COPSYRNA, Stål.

Rio Jan. Hem. ii, p. 69 (1862); Hem. Afric. iv, p. 237 (1866).

Body somewhat cylindrical or compressed: head much narrower than the thorax: antennæ standing up a little beyond the anterior margin of the genæ, second joint short or very short: ocelli not visible: tegmina rounded at the apex: last pair of tibiæ unispinose.

137. Copsyrna maculata, Guérin.

Pæciloptera maculata, Guérin, Icon. Règne An. t. 58, f. 7 (1830-34); Voy. Bél. Ind. Orient., p. 470 (1834): Spin., A. S. E. F. viii, p. 423 (1839): Walker, List Hom. B. M. ii, p. 443 (1851); J. Linn. Soc. Zool. i, p. 92 (1856), p. 161 (1857).
Copsyrna maculata, Stål, Rio Jan. Hem. ii, p. 69 (1862).

Head, thorax, and wings yellowish-white, a little orange on the sides of the mesonotum and at the base of tegmina: head with an oblong patch in the middle of the frons, two approximated dots in the middle of the pronotum, two longitudinal parallel lines in the middle of the mesonotum, and four small dots on the posterior lateral margins, black: tegmina oblong, rounded at the tip, with several brown spots, almost black towards the anterior margin, quadrate, in several places confluent, leaving small white spaces in their midst and forming, towards the tip, three arched parallel bands on the external margin: wings white: beneath and feet pale yellow (*Guérin*). Long, 12; exp. teg., 50 millims.

Reported from Java, Malacca, Singapore.

Genus Nephesa, Amyot & Serville.

Hist. Nat. Ins. Hém., p. 527 (1843): Walker. List. Hom. B. M. ii, p. (1851): Stål, Hem. Afric. iv, p. 237 (1866); Ofvers. K. V.-A. Förh., p. 773 (1870).

Head broad, straight or scarcely arched beyond the eyes; vertex in the form of a very short margin beyond the pronotum, with a slight transverse ridge which separates it from the frons which is broad and has neither a distinct longitudinal ridge nor a transverse groove: ocelli apparently absent: pronotum without a longitudinal median ridge; mesonotum with three almost parallel elevated lines: tegmina with longitudinal and forked veins; of a very fine substance, although slightly opaque; truncated at the tip; margins straight, a little broader at the tip than at the base; external border with very distinct transverse veins; wings almost as long as the tegmina and much broader at the tip than at the base: vulvar plates in ♀ broad, in form of an elongated cone, extending beyond the tip of the abdomen, with a sabre-shaped oviduct, divided into two equal plates, very robust and usually hidden by the vulvar plates: last pair of tibiæ unispinose (*A. & S.*) Differs from *Copsyrna* in having the tegmina truncated at the apex and the head only a little narrower than the thorax.

138. Nephesa rosea, Spinola.

Ricania rosea, Spinola, A. S. E. F. viii, p. 400 (1839).
Nephesa rosea, Am. & Serv., Hist. Nat. Ins. Hém., p. 528 (1843); Walker, List Hom. B. M. ii, p. 433 (1851); J. Linn. Soc. Zool. i, p. 91 (1856): Stål, Ofvers. K. V.-A. Förh., p. 489 (1862); p. 773 (1870); Berlin Ent. Zeitschr. x, p. 393 (1866).
Pæciloptera completa, Walker, l. c., p. 241 (1851).
Flata matutina, Walker, l. c., p. 437 (1851).

♂, ♀. Head, thorax, and tegmina of a slight rosy colour: wings white: body beneath and feet of a pale yellowish colour (*A. & S.*). Long, 22 millims.

Reported from Philippines, Java, Singapore.

Species of doubtful occurrence.

138. *Pœciloptera luteimargo*, Walker, J. Linn. Soc. Zool. i, p. 92 (1856).

Green, with a slight testaceous tinge: frons a little longer than broad with the border slightly elevated and with a slight ridge; sides rounded: thorax ecarinate: pronotum nearly semicircular, extending over the vertex: mesonotum broader than long: tegmina subquadrate at the tips, about which there is a luteous brown-bordered band: wings limpid (*Walker*). Body long, 6¼; teg., 14½ millims.

Reported from Singapore.

139. *Pœciloptera niveina*, Walker, J. Linn. Soc. Zool. i, p. 92 (1856).

White: in structure like the preceding: tegmina with a testaceous marginal band which extends from two-thirds of the length of the costa to the base of the hind border (*Walker*). Body long, 5¼; teg., 14½ millims.

Reported from Mount Ophir (Singapore).

140. *Flata lyncea*, Fabricius, Ent. Syst. iv, p. 42 (1794); Syst Rhyng., p. 55 (1803).

Small: face flavescent, markings black: frons glaucous with a dull black dot on both sides cinctured flavescent and a small line in the middle: thorax glaucous with two rounded dull black spots anteriorly: tegmina and wings hyaline, exterior margin flavescent (*Fabr.*).

Reported from India.

III.—*The Hive-Bees indigenous to India and the Introduction of the Italian Bee.*—*By* J. C. Douglas.

[Received January 11th;—Read January 6th, 1886.]

As I am about to leave Calcutta, and for several months shall not be able to pursue further my investigation concerning the indigenous bees of the genus *Apis*, I present this preliminary paper. I hope on a future occasion to be able to give further details, after I have mounted, examined, and drawn some of the more characteristic specimens; I shall also obtain additional specimens and examine more nests of wild bees.

It is a striking fact that bee-keeping should have been of such trifling value in India, while it has existed elsewhere as a considerable industry from ancient times, has been carried on all over Europe and in parts of Asia and

Africa, in such different climates as those of Norway and Egypt, and on a large scale even in the New World, where no indigenous hive-bees exist.

The honey-bee is indigenous over the whole of India, and the climate is almost universally exceedingly favourable. In 1881, I applied to the India Office for any information available concerning Indian bees and apiculture. The matter was referred to the Government of India, who in 1883 published a collection of papers on the subject. In accordance with a resolution of the Government of India, a large number of specimens of honey, wax, and comb was sent to the International Exhibition at Calcutta in 1884. I collected a large quantity of specimens and many facts, personally, and from correspondents, who took great trouble to render me assistance in the enquiry. I found European entomologists had no more information on Indian bees than Dr. Gerstäcker had given in his paper* published in 1862. I received valuable assistance in my enquiries from Mr. E. C. Rye, through Mr. Tegetmeier of 'The Field;' and Mr. Horton Ellis placed at my disposal the correspondence the late Mr. Woodbury had with the late Mr. F. Smith and others. Herr F. Moravitz, of the St. Petersburg Academy of Sciences, was kind enough, in reply to a letter of mine, to give me such information as he possessed on the subject of Asiatic varieties.

General facts elicited by the enquiry were :—

1. That some species of hive-bee is apparently indigenous to every part of India and that in the plains several species exist.

2. That of the same species found in the hills and also in the plains, the variety inhabiting the colder climate is the more productive.

3. That honey is obtained from even the least productive varieties by suspending or inserting in walls vessels suitable for the habitation of the insects.

4 That bee-keeping of the primitive kind described above is common in the plains, but the more productive the species or variety of bee the less primitive the mode of cultivation ; the lowest form consists in the use of an earthen vessel for a hive and in the destruction of all the bees when taking the honey, as in lower Bengal ; the use of cylindrical hives made for the purpose of wooden logs or earth and wattle, where the bee is more productive, as in the Punjab ; hives built in house-walls, as in Cashmere, where the bees and their brood-nests are not destroyed, but feeding on meal and sugar or honey is practised ; and, finally, where *Apis mellifica* is found, in the Bashahr district of the Punjab, special bee-houses as high as 25 feet are built, and men devote their time to the care and protection of bees.

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* 'Ueber die geographische Verbreitung und die Abänderungen der Honigbiene nebst Bemerkungen über die ausländischen Honigbienen der alten Welt,' in XI. Wander-Versammlung Deutsche Bienenwirthe zu Potsdam, 1862.

5. That the products of the bees building in the open air in the plains are simply taken by driving off the bees by means of smoke; no attempt being made to cultivate the bees, or to "preserve" them in the technical sense.

6. That of about 65 specimens of honey sent to the Exhibition from different parts of the country and examined by me almost all were fermented, thin, and, from a European point of view, utterly unmarketable; samples of hill-honey said to be good were after being kept found by me to be inferior. This inferiority is due (1) to the honey being "unripe" or being taken from the combs of bees building in the open, which honey appears to be thinner than that stored in a hive-house or other close space, and (2) to the method of extracting, which admits of the honey being contaminated by nitrogenous matter from crushed larvæ and pollen.

7. Pure good honey of indigenous bees is unobtainable in Calcutta.

8. As *A. florea* builds inside houses and *A. dorsata* in caves, and under such conditions build larger and multiple combs, yielding larger quantities of denser honey, it appears very probable that, if a well ventilated hive with several openings or one large opening were used, these bees might be hived, and that their honey would then become dense like that of *A. mellifica*, but their comb-building would present difficulties in the way of extracting without injuring brood, and they would probably not defend their hive so as to keep their combs free from moth.

9. Many attempts, extending over several years, had been made by Europeans to hive indigenous bees in the plains, and to import European bees, but without success. *Apis indica* has been successfully cultivated in frame-hives in the hills.

10. The past failures have not been due to inherent impracticability, but to want of knowledge, skill, and experience, or of just appreciation of the initial difficulties. In the case of imported bees, a considerable sacrifice of bees was not provided for, nor were experiments continued sufficiently long to discover the local conditions of success.

11. The alarming accounts given of the viciousness of some Indian bees are not confirmed. The Rev. A. Bunker, Mr. F. Benton, Mr. Dathe, and myself have handled, or hived *A. dorsata*, or had it under observation. Instances of this bee attacking men and animals when wantonly or accidentally irritated by persons ignorant of bee-management prove nothing, as this behaviour is common to most bees in similar circumstances. The number of such accidents reported is extremely small considering the enormous number of bees' nests which exist even in the towns and the scanty clothing worn by the labouring population: three species exist in Calcutta: most gardens contain nests of two species. The relative irascibility of races of bees can only be ascertained by persons skilled in handling bees.

My observations and experiments have been continued since November 1882, and a number of gentlemen interested in the subject have pursued the enquiry during these years, made observations on wild bees, or collected and supplied me with specimens; the objects of this enquiry being to ascertain the habits, structure, affinities, and economic value of the several indigenous species and varieties. Several gentlemen had kept *Apis indica* in the hills. Mr. F. Todd of Landour sent to the exhibition specimens of super and extracted honey so obtained. Mr. Hunter of Landour has also kept this bee, and supplied me with valuable information. I have kept hives of *Apis indica* in Calcutta and taken many nests. Mr. Stocks of Berhampore, Bengal, has several hives of this bee: being more favourably situated than myself he has been much more successful than I in filling his hives, and his bees were evidently preparing to swarm late in December, a wide departure from the usual swarming time when not hived. Capt. R. Fenton, B.S.C., kept the Bhootan bee in Bhootan, and sent several stocks to Calcutta. I kept this bee in Calcutta for two years and had one hive swarm naturally. The Rev. A. Bunker of Toungoo had recently 8 hives of the variety of *A. indica* indigenous to that place: he was very successful in filling his hives, but ultimately lost most of his stocks from moth. Mr. Bunker and myself have had *A. dorsata* under observation, Mr. Bunker has hived it, and two experienced bee-masters from Germany have also hived it independently; but all attempts at hiving it permanently have been unsuccessful. Many combs of *A. dorsata* have been searched by me, and at my request, for drone-cells, but in every case the comb was found uniform throughout in the size of the cells. I have taken nests of *A. florea* and had this bee under observation. Mr. A. Bunker has hived it. It will be seen from the above that a series of laborious experiments and a large number of observations have been made extending over more than three years; and, besides the operations detailed, many persons have sent specimens and given information of great value.

APIS INDICA.—Found all over India, in the plains and on the hills; kept by natives in rude hives, most in the hills, but also in the plains; kept near Calcutta by villagers, who insert earthen vessels in the walls of their houses to serve as hives and destroy the bees periodically. Nests of this bee common in Calcutta. This bee differs in colour, being lighter in the plains than in the hills; it appears constant in size of body and of its cells all over India, in such different climates as those of Chumba, Landour, the Khassia Hills, and Lower Bengal; in habits it corresponds to *A. mellifica*, its stocks are much lighter than those of *A. mellifica*, but may be greatly improved by cultivation; and it is exceedingly liable to be attacked by moth. Most nests examined contained moth, and several were badly ravaged. Persons who have kept the bee complain of losing even the heaviest stocks from moth. It permits other insects to share its quarters, and does not keep its hive so clean as *A. ligustica:* the difference is very striking. The ravages of moth are worst during the rains, when the bees decrease in number. This bee swarms in the hot season and just before the rains, it works during the rains and the cold season, but is apparently less active in the cold weather than *A. florea.* A stock in a frame-hive prepared to swarm in the cold season, having been fed and otherwise protected. Near the hills this bee often migrates at certain seasons. The largest yield of honey reported from one hive is 30lbs.

Description of Nest.—In one nest examined the measurements were:—thickness of comb minimum ·59″, max. ·79″, distance between faces of combs ·27″ to ·39″, distance of combs from centre to centre ·98″ to 1·18″ (·98 appeared normal). A barrel-shaped hive from the Punjab was 18 inches deep and 11 inches in diameter, content about 1600 cubic inches; it contained 14 combs, a large quantity of drone-brood, and a large number of drones; the covered worker brood-comb was ·79″ to ·95″ thick, the drone brood-comb was ·98″ thick, the store brood-combs reached 1·18″ in thickness, the distance between the brood-combs was 315″, and the distance from centre to centre of store-comb was min. 1·3″, max. 1·772″ on outside combs; the normal distance between combs is less than ⅓″ and the thickness of the combs somewhat over ¾″; the worker-cells are 6 to the linear inch, and the drone-cells 5; actual measurements of worker-cells 3 cells = ·513″ = 5·85 per inch; 3 cells = ·494″ = 6·125 per inch, average 5·95. The measurements were made with a vernier.

THE BHOOTEA BEE.—All bees, including queen, very dark, almost or quite black, with light hair; comb—worker 5½ and drone 4½ cells per linear inch, drone-comb a full inch thick. Exceedingly mild in temper, in fact, cowardly; the sentinels commonly running in when those of *A. mellifica* would rush out and attack. Stocks apparently heavier than those of *A. indica.* Kept in Bhootan by Capt. R. Fulton and in Calcutta by myself. One hive swarmed naturally in Calcutta. Given *A. mellifica* worker-comb used it as drone-comb, bred large number of drones; yielded no surplus honey, 6 lbs only being found in hive at end of season. Very liable to moth.

The behaviour of both the above towards moth is quite different from that of *A. ligustica.* They do indeed attack the moth and tear down their combs; but if a larva of wax-moth be dropped into a hive of *A. ligustica*, the bees become excited, and at once sting the larva and carry it out. The Indian bees, on the contrary, do not notice the larva, the Bhootea bee particularly, and I have dropped larvæ between the combs without causing any commotion or exciting the bees to sting the larva.

This bee is much larger than *Apis indica*. It is certainly at least a constant variety or race differing widely from *A. indica;* possibly a different species: the young queen of the hive that swarmed "mated pure," although *A. indica* was present in large numbers in the neighbourhood, but the Bhootea drones were very numerous. If not a different species, it is certainly close to the debatable ground between "species" and "variety." It appears that the Bhootea bee and *A. indica* do not breed with *A. mellifica:* I bred about 25 Italian queens only 5 of which mated by reason of my having but very few drones; the honey supply apparently failed suddenly when not expected and the Italians destroyed the drones; I, however, let all the queens fly till mated, lost, or incapable of mating, but in no case was a queen impregnated by a drone of the Bhootea or Bengal species, though I had some thousands of Bhootea drones in the same apiary, and *A. indica* was plentiful. I found also that a queenless hive of *A. ligustica* would sting a Bhootea drone to death instantly, if he were placed on the flight-board; bees do not destroy their own drones by stinging them; they worry and starve them. Both *A. indica* and the Bhootea bee attempt to rob *A. ligustica*, but not to any important extent; and they both abscond very readily, unless they have been a month or more in the hive; *A. indica* is the more prone to abscond. One hive of *A. indica* had a laying worker when queenless.

Both the above species are what would be termed swarming bees, that is to say, they breed many drones and swarm frequently. The Bhootea bee is exactly midway in size of body and of cell between *A. indica* and *A. mellifica*, and it differs from both more widely than do any two varieties of *A. mellifica* from one another. Though the Egyptian variety (*A. fasciata*) builds a slightly smaller comb, it can use the comb of *A. ligustica*.

APIS DORSATA builds under boughs, normally a single comb, but under favourable conditions, as in caves, it duplicates its comb. Cells 4½ to the inch. No drone-comb differing from worker found in any comb examined. In a comb from S. Coimbatore the actual measurements were 3 cells = ·645″, *i. e.*, 215″ each, or 4·65 cells per inch; other three were ·225″, ·218″, ·230″, average 4·425 per inch. The Sikkim variety is larger than that found in the plains, and the hill varieties generally appear darker and larger than those of the plains; specimens from Jubbulpore are very light-coloured. A comb of the Sikkim variety would be interesting to ascertain if it differs from the comb of the plains, and if it has drone-cells. In many parts it migrates at certain seasons, and it leaves its comb readily on failure of pasturage. It is reputed vicious, but this is not confirmed by experts; nor is its sting exceptionally severe. This bee is confined to the plains or does not extend beyond about 3000 feet of altitude. It builds no special drone-comb, all its cells are the same size, and its drone is not differentiated from the worker as is that of other species, but is of the same size and shape as the worker, excepting that it has the eyes meeting, as in the drone of *A. mellifica*.

APIS FLOREA OF FLORALIS, the latter being a literary correction only. This is the smallest known species of the genus, and its drone is relatively to the worker the largest and most differentiated from the female and worker. It inhabits the plains or not above 3000 feet of altitude, its worker-comb is very regular, the drone-cells have much thicker walls and are cylindrical. Drone-cells 6, worker-cells 9 to the linear inch. Actual measurements of a comb from South Coimbatore gave 5·725 drone and 8·925 worker-cells per inch. When this bee builds on a thin branch, its comb is very small, about the size of a man's hand, and single; but built in a building the comb may attain to several square feet in area and be partially duplicated. This bee is very mild in disposition, and its sting is not so severe as that of *A. indica*. It may be mentioned that bees generally appear readily to become familiarized with man's presence, the bees of a hive frequently opened and bees building near roads and paths and in houses appear to become less irritable and impatient of interference than those which inhabit secluded places, but bees that are starving, diseased, robbing, or being robbed are liable to become irritable. This species appears very constant in size and colouring.

This bee is described and figured by Latreille as "*A. indica*, Fab.," and *A. indica*, as *A. socialis*; the descriptions are very imperfect and the figures inaccurate; full descriptions will be given hereafter.

THE BUSHAHR BEE.—This is a variety of *Apis mellifica*. The specimens I have are dark with black scutellum, excepting in one specimen, in which that part has a dark red mark on it. The comb corresponds exactly with that of *A. mellifica*. This bee is found in the Bushahr district of the Punjab and probably elsewhere along the northern frontier; it is said to be readily manipulated, a trait not common amongst the varieties with a light scutellum. It is no doubt productive, as the natives of Bushahr build stone houses 25 feet high for its reception and follow the care of bees as a special industry. This bee would prove of considerable economic value if acclimatized in other parts of India. The few drones I have are smaller than those of *A. ligustica*. Its power of resisting moth are unknown.

HAZARA VARIETY.—This appears to be a variety of *A. mellifica*. Specimens of workers only are known to me, and they are perceptibly smaller than *A. ligustica* and than the Bushahr variety. It has a yellow scutellum and is striped yellow shaded off at the sides, as in the Egyptian bee (*A. fasciata*). This variety would no doubt prove productive in the plains, but would probably resemble the Egyptian bee in its qualities.

The principal points on which information is required with reference to the above two varieties of *A. mellifica* are :—proneness to breed drones and to swarm, weight of stocks, liability to moth and other parasites and to disease, liability to have laying workers, liability to suffer from robbing, prolificness and longevity of queens, sensitiveness in breeding to variations of honey-supply, whether easily manipulated, *i. e.*, if excitable and if readily subdued, if they keep on their combs or fall off readily, and if they are readily shaken off, what quantity of surplus honey they collect. Persons who are favourably situated for obtaining information on any of these points have it in their power greatly to further the interests of Indian apiculture.

Many persons have speculated on the origin of *A. mellifica*, whether it originated in a cold, in a temperate, or in a warm climate, under what conditions, and from what kind of progenitor, it was developed ; but based as it was on data furnished by a single species their reasoning must, it is obvious, have been very far from conclusive. The different species and varieties found in India may afford data most pertinent to the questions at issue, and, as the hive-bee has been so widely and closely studied, a complete knowledge of its *different species* and their distribution would be of general biological interest.

DISTRIBUTION.—Dr. A. Gerstäcker concludes, from an examination of his specimens (1862), that the Southern Italian variety of *A. mellifica* extends to the islands and mainland of Asia Minor and the Caucasus, and the Egyptian variety over Syria and Arabia, through imperceptably minute variations in the Himalayas, on to China ; he had only one specimen from the Himalayas and one from China for examination. Herr F. Morawitz kindly informed me (1882) that in Asiatic Russia the hive-bee is only found in Siberia and Transcaucasia, in the eastern territory the form common to Northern Europe, in the latter only *Apis ligustica*. The honey-bee has not been brought from Central Asia by any Russian traveller ; nor has Trschewalsky found it in any of the Chinese provinces visited by him. Efforts had been made to introduce it into Taschkend, but up to the date of Herr Morawitz's letter without success. I may state that attempts to introduce the hive-bee into Australia have repeatedly failed,—as they have done in the case of India,—but ultimately proved successful. The variety of *A. ligustica* referred to by Herr Morawitz is no doubt that found in Southern Italy and distinguished by the yellow scutellum ; the Hazara bee has this character. I defer discussing the relations of the Indian species (*A. indica* and *A. mellifica*) to the European species, until I have made a full examination of the specimens I have collected.

In *A. florea*, we have the worker-cells very much smaller than the drone-cells, we find the small cells beautifully regular and quite hexagonal, whereas the drone-cells, being so large comparatively, are cylindrical and have thick walls. In this fact we have a confirmation of the theory that the hexagonal form of the bee's cell is due, not to design on the part of the bee, but to the crowding together of cells which would, if constructed separately, be cylindrical.

The origin of the European species has been repeatedly discussed. Dr. Gerstäcker has discussed the opinions of a number of authorities in his paper referred to above, the principal question being whether the hive-bee is indigenous to Germany and Northern Europe, or whether it was introduced from a warmer climate. The arguments adduced in favour of its being indigenous to Northern Europe are the great difference between the yellow striped bees of Southern and South-Eastern Europe, Northern Africa, and Asia Minor and the dark-coloured bees of Northern Europe; the constancy of the yellow-striped Italian and the dark-coloured northern varieties when they are kept separate, even though the striped variety be introduced into Germany; and that the races were in contact in the region of the Alps before the introduction of the Italian bee into Germany. It may be noted that these varieties breed freely together, and that the Italian bee was only introduced into Germany in 1853. I find that the Hazara variety, from the Hazara district of the Punjab, has the light scutellum, is somewhat smaller than *A. ligustica*, has the yellow bands ending at the sides, and light hair, that it corresponds, in fact, to the Egyptian bee; and that the Bushahr bee has the dark scutellum, is somewhat larger, and dark-coloured like the Northern European variety. *Apis indica* of Lower Bengal is a yellow-striped bee; the Bhootan bee is very dark indeed and also larger; *Apis dorsata* appears also to vary in the same way, the varieties found in Lower Bengal and Jubbulpore being lighter in colour and smaller than that found in Sikkim: the variation in size and colour thus following the same law in India as in Europe and Northern Africa. The arguments advanced by Dr. Gerstäcker in favour of the Northern European bee being descended from progenitors introduced from the south are, the proved possibility of its introduction from the south and acclimatization, and the absence of wild bees in Northern Europe, whereas they are common in the south. Dr. Gerstäcker objects that the hive-bee introduced into America has not confined itself to the southern parts as it would have done if it had been of southern origin, but that the northern and central states have appeared most favourable to it; and that hive-bees do occasionally run wild, and were once wild, in Germany, but that the changes due to extended cultivation of the land and the more complete domestication of the insects render this very unfrequent. It may be replied that in India in the plains wild bees abound not only in the forests but in the large towns, and that Cuba and warm countries generally are favourable to bee life, but that the varieties and species found wild differ widely with climate, and that those of one climate do not naturally—and for obvious reasons—spread into an adjacent widely differing climate, for wild life in which their differentiation has unfitted them, but that, when man cultivates the animal under different climatic conditions, his care removes the adverse conditions. The data supplied by *Apis mellifica* alone must leave the question inconclusive, but in India we find several species each varying with locality, all wild, and the data supplied are of higher value. We find the same law as to variations of colour and size with climate in India for three species certainly as is found in Europe for *A. mellifica*. We find *A. dorsata*, apparently the least differentiated form, building no drone-cells, the drone being about the same size and shape as the worker, differing, however, in the head; this species builds normally one comb under a bough, the worker is long in shape, resembling somewhat in this respect the queens of the other species. *A. florea* is apparently highly differentiated, its drone differing most in size and shape from the worker. The queens of *A. mellifica*, *A. florea*, *A. indica*, the Bhootea, and the Bushahr bees differ much less in size and shape than do workers and drones of the respective races, the perfect female being the least and the drone the most differentiated. *A. florea* and *A. dorsata*, living under more constant conditions, might be expected to vary less, respectively, than the bees building in cavities fitting them for inhabiting widely different climates, *e. g.*, *A. indica* of Lower Bengal and the Bushahr variety of *A. mellifica*. The nest of single-comb bees is simpler than that of multicomb bees and obviously less protective, for the bees are spread out instead of being able to cluster; the simpler nest is obviously only suited to warm climates. But the single-comb bees duplicate their combs under favourable conditions; they inhabit caves and other cavities, *A. florea* building in houses; under these conditions they duplicate their combs and their honey becomes denser like that of *A. mellifica*, but they do not appear to start a number of parallel combs like *A. mellifica*. The nest of the single-comb bee merges into that of the multicomb bee, and the bee building in the open air merges into the bee inhabiting a cavity. In regions near the hills and mountain slopes all the bees appear to migrate: *A. dorsata* and *A. florea* readily move from place to place, in the plains, if food fails: *A. indica* readily absconds if interfered with, while *A. mellifica* does not abscond, excepting under severe pressure, as when the number of bees is reduced to very few. If we suppose *A. mellifica* descended from a progenitor, somewhat like *A. dorsata*, inhabiting a hot climate, we are enabled to explain many of its habits: the habit of clustering on a branch when swarming, no longer of use, is a survival of a habit of its progenitor: so also its absconding under pressure and the rearing by it of drones in worker-cells so very common under certain conditions. Migrating would evidently be much easier for a species building on a branch in a warm climate than for one to which a cavity was necessary in a temperate or cold climate: hence this habit would tend to disappear, as in *A. mellifica.* It may be urged that the storing of food proves the bee indigenous to a climate with a pronounced winter, but even in the tropics there are periods when flowers are scarce or a season of heavy rain prevents the collection of food, and the safety of the brood renders some stores essential; nor could the large quantity of brood necessary to keep up the race in spite of its enemies and hardships be dependent on food gathered as required. In Lower Bengal, *A. indica* collects very little, if any, surplus honey; the surplus of a single year is enormously increased by cultivation, and bears no fixed relation to that which would be produced by the same bee naturally; an enormous number of stocks of *A. indica* perish every season from moth and want of stores. The Italian bee is esteemed for its relatively great ability to protect itself from moth, and to keep its hive clean and free from other injurious insects; the black bee of northern Europe is inferior in this respect; this is probably an acquired peculiarity possibly due to many centuries of protection by man. *A. indica* occupies necessarily any cavity in wall or tree it can find, and it could not defend the usually large entrances to such cavities even if it tried: hence it commonly shares its dwelling place with other insects, and it cannot keep this dwelling clean; in a hive it permits vermin to collect and allows an accumulation of *débris* to harbour its enemies. It appears to defend its combs rather than its hive, as would a single-comb bee building in the open. I purpose, when I can find leisure, to give fuller descriptions of the several species and varieties of Indian hive-bees after making accurate drawings and measurements and examining carefully a large number of specimens of the numerous varieties of the different species. Efforts will be made to ascertain the economic value of the Bushahr variety of *A. mellifica.* Mr. Minnickin, the officer in charge of the district in which this bee occurs, has been supplied with appliances, and I have had the pleasure of explaining and demonstrating to him their use. I hope some stocks will be sent to Simla and hived there; and I have suggested that the Punjab Government should supply some stocks of this and of the Hazara bee to a number of gentlemen who had expressed their willingness to introduce the Italian bee. It is to be regretted that the economic value of this bee cannot be investigated by an expert.

INTRODUCTION OF THE ITALIAN BEE.—The acclimatization of a foreign animal in a new habitat demands justification, and should be recorded; I know of no more fitting record than the publications of this Society in whose garden the first Italian queens have been bred, the first honey collected by Italian bees harvested, and the first stock distributed in India. I decided to introduce a foreign race because little was known of the native races, and the information then available shewed that the latter were either of inferior economic value, or that years of study under cultivation would be necessary to discover the best mode of treating them. All the most experienced bee-masters I consulted agreed with me in considering India a most favourable field for apiculture, and that to ensure success it merely required that the subject should be taken up by some one who had sufficient knowledge and skill to adapt his method to the local conditions. I found the former attempts had failed from causes I well understood. The Duke of Buckingham gave me full information about his effort to introduce bees while he was Governor of Madras. The present editor of the British Bee Journal, Mr. W. Cowan, agreed with me as to the cause of this failure. The Rev. J. S. Woodside, an American Missionary, tried to introduce the Italian bee and failed. I chose Italians because the most extended experience in Europe and America had demonstrated their superioity: they are very productive, proof against moth even when weak, easy to manipulate, thoroughly understood, readily and cheaply obtainable in Italy, and—a minor point—they are a handsome race. Herr F. Morawitz recommended to me the Egyptian bee as most likely to be suited to the climate. This bee was introduced into Germany by the Acclimatization Society at Berlin in 1864, brought from Egypt by Herr Hammerschmidt, but in the best hands it was found of little value and not preserved; I have since discovered in the Hazara variety a race apparently nearly allied to the Egyptian bee. The Cyprian bee has been strongly recommended and much puffed in dealers' advertisements—a single hive in one season is said to have yielded 1000 lbs. of surplus honey; but this variety is at least uncertain in temper, it cannot be regarded as in a higher than the experimental stage, and some of the most experienced bee-keepers in America are giving it up; it and the Syrian and Holyland varieties are most certainly unsuited to the purpose of introducing bee-culture amongst a people who wear very little clothing and have as yet no skill in bee-management. The black bee of England and Northern Europe is inferior in its power of resisting moth, and has been replaced in America by the Italian for this reason; the Southern Italian bee is inferior in temper to the Northern Italian, the race referred to generally as the Italian bee; hence I selected the latter race, and I strongly recommend that it be exclusively imported so long as it is necessary to import bees. The economic value of the Bushahr, Hazara, and possibly other Indian varieties of *A. mellifica* which may be discovered hereafter, remains to be ascertained; it is not likely to be higher than that of *A. ligustica*; and, from Mr. Minnickin's account, I should think it would prove lower. I think the Hazara race will probably prove to be like the Egyptian or Syrian.

I have imported Italian bees, a large proportion of which died or contracted disease or debility on the voyage so that they proved useless, or in some cases had to be destroyed some time after arrival; twice the imported bees were in great danger of extinction. I have sent 3 stocks to Landour, one of which was lost by an accident immediately after arrival, and the others are doing well and are reported by the expert Mr. F. Todd who has them, to be "Splendid honey gatherers and easy to manipulate." I had to leave Calcutta on leave, and in my absence I lost some queens and bees, but I have four stocks at the Alipore Jail Apiary, two of which will shortly be sent to Burmah, to the Rev. A. Bunker, who has been keeping indigenous bees for some time. The difficulty of importing queens has now been surmounted; they can be imported safely and well with very little risk for about 10 shillings each. I have devised a portable hive and water-boxes which I believe will enable me to import bees as required without the enormous losses hitherto experienced. I am about to send the pattern hive to Italy and to order four stocks as a trial; if successful, I have no doubt there will ultimately arise a trade in bees and queens between Italy and India, as there is between Italy and America and other countries. I have written a handbook for India which has been published by the Government of India, and this has excited much interest in the subject. I have distributed literature and shewn a number of persons how to handle bees and to use the modern appliances. I have designed a set of simple cheap appliances suited to Indian requirements, and these are on sale at the Alipore Jail. I have issued a large number of hives, etc. Finally, by taking 80 lbs. of honey and by breeding a large number of queens, of which five were impregnated, I have demonstrated that *A. mellifica* can be successfully cultivated in Calcutta even under the unfavourable conditions presented by weak stocks placed in the centre of a large city, under climatic conditions not previously studied, with the necessity for devising suitable and cheap appliances, and other difficulties always presented by the introduction of a new industry. I find it better in Calcutta to place the hives in the open, not under trees or verandahs; I use a double-walled hive painted white with a chaff cushion under the roof; the flight-hole in the hot weather should be at least 12 inches long by $\frac{3}{8}''$ wide; it may be contracted in the cold weather. In the very hot weather the hive should be shaded by a durmah mat on the roof, or a mat shade, from the afternoon sun. In a short time I hope to be able to arrange for the supply of bees direct from Italy; my official engagements preventing me from breeding queens and distributing bees from Calcutta as I had intended.

Of the enemies of bees, the larger hornets are troublesome for a short period of the year. They carry off bees, and large flight boards should be removed from hives at this season in an apiary. A boy with a bag-net to catch and kill the hornets and the destruction of hornets' nests with turpentine or other agents would be appropriate remedies. The wasp or yellow hornet does no harm, unless the hive entrance is too wide. Weak stocks always require special protection, but I have found *A. ligustica* well able to defend itself against wasps, and even the large hornets have been found by me dead on the flight-board. The large death's-head moths are said to rob bees in Europe, and to be proof against the bees' anger. I once found two dead moths inside a hive ; they were dry and had evidently been killed by the bees. On another occasion I noticed great excitement in a hive and found it due to a large number of bees engaged in removing a death's-head moth they had just killed in the entrance to the hive ; this moth was 2½″ long from head to tips of closed wings. It is probable that this moth robs *A. indica* and *A. florea*. Toads sit in front of hives in the evening and catch the bees, unless the hives are occasionally visited at this time and the toads destroyed. Lizards visit hives and live under the hive or get between the walls of hives. A nest of large black ants once attacked a hive of *A. ligustica*, but such occurrences as this are easily guarded against. It does not appear that the enemies of the hive-bee are worse in India than elsewhere, excepting the large hornets, and these would be readily dealt with in the case of apiaries ; in England, boys are paid a trifling sum for queen-wasps, and nests of these pests are destroyed by means of a little turpentine ; traps are also used. The fact that the wild hive-bees are so exceedingly abundant proves they are able without man's protection successfully to struggle against their enemies, while their number must act to reduce the number of the cultivated bees destroyed.

IV.—*List of the Lepidopterous Insects collected in Tavoy and in Siam during* 1884-85 *by the Indian Museum Collector under* C. E. PITMAN, ESQ., C. I. E., *Chief Superintendent of Telegraphs.* Part I. Heterocera.—*By* FREDERICK MOORE, F. Z. S., A. L. S. *Communicated by the* NATURAL HISTORY SECRETARY.

[Received and read Feb. 3rd, 1886.]

Family **Sphingidæ.**

1. CYPA DECOLOR, Walker, Catal. Lep. Het. B. M. VIII, p. 255.

Ponsokai, Siam.

Family **Zygænidæ.**

2. TRYPANOPHORA HUMERALIS, Walker, Catal. Lep. Het. B. M. VII, p. 1593.

Tavoy.

Family **Chalcosiidæ.**

3. MILIONIA PYRIZONEA, Butler, Ann. & Mag. Nat. Hist. 1882, p. 375.

Tavoy, and Ponsokai, Siam.

4. CODANE LEUCOMELAS, n. sp.

Female. White: forewing with a broad transverse purplish-black apical band, and a narrow medial oblique band, decreasing to a point at its lower end and from the upper end of which the costal border is also black; three white obliquely disposed subapical spots, and a very narrow one with bordering white cilia at the apex: hindwing with a similar coloured marginal band, and a single white apical spot. Thorax, head, and antennæ bluish-black; palpi, legs, and abdomen white.

Expanse $1\frac{9}{10}$ inch.

HAB. Ponsokai, Siam.

This species differs from the same sex of *C. zelica*, on the forewing, in the apical and middle black band being narrower, the inner margin of the apical band crossing at the angle of the upper median vein, at which point it is slightly bent, and is thence straight to the posterior angle; the middle band is about half its width, and ends in a point posteriorly, the three subapical and apical white spots are similar: hindwing with a somewhat narrower black marginal band, and a larger white apical spot.

Family **Nycthemeridæ.**

5. NYCTHEMERA COLETA, Cram. Pap. Exot. IV, pl. 368, f. H.

Tavoy.

6. NYCTHEMERA TRIPUNCTARIA, Linn. (Cram., Pap. Exot. I, pl. 22, f. E.)

Tavoy.

Family **Lithosiidæ.**

7. PERIDROME SUBFASCIATA, Walker, Catal. Lep. Het. B. M. II, p. 446.

Tavoy.

8. NEOCHERA MARMOREA, Walker, Catal. Lep. Het. B. M, VII, p. 1674.

Tavoy.

9. HYPSA STRIGIVENATA, Butler, Trans. Ent. Soc. Lond. 1875, p. 321.

Tavoy.

10. BARSINE COCCINEA, n. sp.

Forewing vermillion-red; crossed by an olivescent-grey inwardly-oblique subbasal band, an outwardly-oblique medial band, and a broader inwardly-oblique discal band; the two former bands joined together at their upper end, and to the latter band at the lower end; a small similar coloured basal spot, and a series of oval spots bordering the outer band, the interspaces between the bands and the spots being yellow; cilia yellow; hindwing pale pinkish-red, the veins yellowish. Thorax, head, palpi, antennæ, and legs vermillion-red; tegulæ with an olivescent-grey spot.

Expanse $1\frac{2}{10}$ inch.

HAB. Tavoy.

Family **Liparidæ.**

11. NUMENES INSIGNIS, Moore, Catal. Lep. Mus. E. I. C. II, pl. 10, f. 6.

Tavoy, and Ponsokai, Siam.

12. LYMANTRIA ASÆTRIA, Hübn., Samml. Exot. Schmett. II. f. 1.

Tavoy.

Family **Hepialidæ.**

13. HEPIALUS TAVOYANUS, n. sp.

Male. Pale vinaceous-brown: forewing with some darker brown quadrate costal marks, some also within and below the cell, an irregular-shaped zigzag-bordered discal band, a marginal row of small hemispherical spots, and a marginal black conical spot between the lower median and sub-median veins; all these markings with a slender ochreous border; hindwing darker vinaceous-brown, ochreous at the base; cilia ochreous from below the upper median vein. Hind part of thorax and base of abdomen clothed with ochreous hairs.

Expanse $1\frac{4}{10}$ inch.

HAB. Tavoy.

Family **Urapterygidæ.**

14. THINOPTERYX CROCOPTERATA, Kollar in Hügel's Kasch. IV, p. 483.
Tavoy.

15. ENCHERA PITMANI, n. sp.

Silky white. Forewing crossed by a pale cinereous-black, outwardly recurved, slender antemedial band, a broader medial macular band including a portion within the cell, followed by three postmedial bands, the inner one of which is indistinct, the next slender, palest, and the outer one macular; beyond is a submarginal row of prominent black oval spots, and a marginal row of less prominent spots; base of the costa with spots between the bands: hindwing crossed by three short slender similar coloured bands, the inner one being very indistinct, followed by a prominent sub-marginal row of black spots, and less distinct marginal spots. Body white; head and palpi black; forelegs, and tarsi cinereous-black.

Expanse ♂ ♀ 2½ inches.

HAB. Tavoy.

Family **Microniidæ.**

16. MICRONIA CASEATA, Guén., Phal. II, p. 27.
Tavoy, and Ponsokai, Siam.

17. MICRONIA ACULEATA, Guén., Phal. II, pl. 13. f. 8.
Tavoy, and Ponsokai, Siam.

18. MICRONIA VAGATA, Moore, P. Z. S. 1867, p. 622. pl. 60, f. 18.
Tavoy.

19. MICRONIA OBTUSATA, Guén., Phal. II, pl. 5. f. 6.
Tavoy.

Family **Palyadæ.**

20. EUMELEA ROSALIA, Cram., Pap. Exot. IV, pl. 368. f. F.
Tavoy.

Family **Euschemidæ.**

21. EUSCHEMA MILITARIS, Linn., S. N. I. 2. p. 811.
Hills between Burmah and Siam.

22. EUSCHEMA SODALIS, n. sp.

Nearest allied to the Bornean *E. subrepleta* (= *bellonaria*, Guén., Phal. pl. 18). Comparatively longer in expanse of wings, and of a much paler yellow colour. On the forewing the three black basal bands are narrower, and, though entire in their length, are well separated at their ends, the adjoining outer yellow parts are broader in extent, and the portion below the lower median and submedian vein is continuous, not being formed by two well-defined parts as in *subrepleta.* On the hindwing the black markings are similarly disposed, but the discal zigzag band is much narrower, being only half the width of that in *subrepleta,* thus giving a wider and continuous outer yellow portion; the submarginal spots are narrower, separated, and more or less disconnected from the marginal spots.

Expanse 2⅛ to 2¾ inches.

HAB. Tavoy.

23. EUSCHEMA LUNULATA, Butler, Ann. & Mag. Nat. Hist. 1882, p. 375.

Hills between Burmah and Siam.

24. EUSCHEMA HORSFIELDII, Moore, Catal. Lep. Mus. E. I. C. II, pl. 8, a. f. 7.

Tavoy.

Family **Hyblæidæ.**

25. HYBLÆA CONSTELLATA, Guén. Noct. II, p. 391.

Tavoy.

Family **Ophideridæ.**

26. RHYTIA HYPERMNESTRA, Cram., Pap. Exot. IV, pl. 323. f. A. B.

Tavoy.

27. OTHREIS FULLONICA, Linn. (Cram., Pap. Exot. I, pl. 77. f. C.)

Tavoy.

28. PHYLLODES VERHUELLII, Voll., Tijd. v. Ent. I, p. 161. pl. 8.

Tavoy.

29. POTAMOPHORA MANLIA, Cram., Pap. Exot. I, pl. 92. f. A.

Tavoy.

Family **Erebiidæ.**

30. SYPNA APICALIS, Butler, Tr. Ent. Soc. Lond. 1881, p. 206.

Tavoy.

Family **Ommatophoridæ.**

31. PATULA MACROPS, Linn. (Cram., Pap. Exot. II, pl. 171. f. A. B.).

Tavoy.

32. ARGIVA HIEROGLYPHICA, Drury, Exot. Ins. II, pl. 2. f. 1.

Tavoy.

33. NYCTIPAO EXTERIOR, Walker, Catal. Lep. Het. B. M. XIV, p. 1306.

Tavoy.

34. NYCTIPAO CREPUSCULARIS, Linn. (Clerck, Icones, pl 53. f. 3. 4.).

Tavoy.

Family **Dysgoniidæ.**

35. DYSGONIA CRAMERI, Moore, Lep. Ceylon, III, p. 177. pl. 171. f. 2.
Tavoy.

36. CHALCIOPE MYGDON, Cram., Pap. Exot. II, pl. 156. f. G.
Tavoy.

37. CALESIA LEUCOSTIGMA, Kollar (Moore, Lep. Ceylon III, p. 182).
Tavoy.

38. CALESIA HÆMORRHOA, Guén., Noct. III, p. 258.
Tavoy.

Family **Remigiidæ.**

39. CAUNINDA ARCHESIA, Cram., Pap. Exot. III, pl. 273. f. F. G.
Tavoy.

Family **Thermesiidæ.**

40. PLATYJA LOBIFERA, n. sp.

Female. Dark vinaceous-brown, numerously speckled with cinereous-grey scales: forewing crossed by an ochreous-white speckled bordered, black, sinuous, basal line, an antemedial line, and an irregular recurved, sinuous, postmedial line, the latter partly encircling a whitish lower discal lobate spot, then curving upward to end of the cell, and from thence downward to the posterior margin; a marginal row of ochreous-white points: hindwing cinereous-brown along the costa; with a short black lunular with whitish outer border extending from the anal angle to near the apex; a marginal row of whitish points. Body, head, palpi, and legs cinereous speckled; third joint of the palpi, and tarsal joints with an ochreous-white band.

Expanse $1\frac{5}{10}$ inch.

HAB. Ponsokai, Siam.

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V.—*A List of Butterflies taken in Kumaon.—By* WILLIAM DOHERTY, *Cincinnati, U. S. A. Communicated by the* NATURAL HISTORY SECRETARY.

[Received April 22nd;—Read May 5th 1886.]

Last year I spent several months catching butterflies in Kumaon, a British district in the middle portion of the Himálayas, lying between the district of Garhwál and the independent kingdom of Nepál. The results of my visit are embodied in the following pages. In August, I made a rather successful excursion to the Pindari Glacier in the north-west of the district, and, from the latter part of September till early in December, I was engaged in a much longer expedition to the north-east. This time I was unfortunate; I found the low country too dry, and the high country too cold, and failed in both. Circumstances repeatedly delayed me, and when in the middle of October I finally succeeded in reaching Tagla Khar in Chinese Tibet, I found the ground frozen solid, and all the butterflies gone. So I would suggest to any entomologist resorting to these regions, that the three summer months are the only good ones for collecting, either on the desert plains of Tibet, or in the deep valleys of the Himálayas sheltered by the Outer Range from the violence of the monsoon rains.

A few remarks on the local distribution of butterflies may not be amiss. The great Desert Region of India does not approach the Himálayas, though a few stragglers of the genera *Callosune* and *Idmais* may be seen in the wide marshy meadows of the Tarai. The characteristic.

butterflies of this region (which covers all India proper except the Himálayas, Bengal, Malabar, and the forest-covered districts of the Eastern Gháts and the Central Provinces) are usually of African genera, and often of African species, *e. g.*, *Charaxes fabius*, *Yphthima nareda* and *Y. asterope*, *Apatura misippus*, *Junonia œnone* and *J. orithyia*, *Hypanis ilithyia*, *Tarucus theophrastus*, and *Pieris mesentina*. The next region is that of the Tarai, the Bhábar (or *dry* Tarai), the foot-hills, and the low valleys, reaching up to three thousand feet. Its fauna is more or less tropical, and should rather be called Indian than Himálayan, the genera being for the most part spread over wide areas in the East. In Kumaon it is covered with forest containing a great variety of trees. The next region, which may be called the Lower Himálayan, extends from 3,000 to 7,000 feet, and is in Kumaon covered with a thin and open growth of the 'chir' pine *(Pinus longifolia)*. Above this lies what I may call the Upper Himálayan tract, extending from 7,000 to 10,000 feet, and clothed with a dense forest of oaks, firs, and rhododendrons. These two regions contain nearly all the typical Himálayan forms. To the first belong many species of *Lethe*, *Ilerda*, *Yphthima*, *Mycalesis*, *Libythea*, *Dodona*, *Abisara*, *Neptis*, *Athyma*, *Symbrenthia*, and a considerable variety of the *Theclinæ*. In the second such genera as *Zephyrus (Thecla)*, *Rhaphicera*, *Zophoessa*, and *Aulocera* abound. Above 10,000 feet one comes to a fauna chiefly Palæarctic. My collecting in this region was a failure, but it seems to me that there must be a difference between the butterflies of Dárma and Byáns—Alpine valleys covered with great pine-woods and rich meadows of heather and grasses—and those of the Chinese province of Ngári or Hundes, a lofty and desert country with but a few inches of rainfall (in June, July, and August), and hardly any vegetation, except on the banks of streams and at the edge of the snow, the melting of which affords moisture throughout the warmer months.

These zoological zones are by no means well-defined, and some species seem to set all laws of distribution at defiance. At Baghi north of Simla, I have observed a *Parnassius* and a *Catopsilia* alight on the same flower. In Kumaon, where I have seen palms and pines growing side by side, a troop of monkeys on a birch tree, and a flock of parrots on a fir, similar contradictions occur. An *Aulocera* is common in the Kali Valley down to 2,500 feet and even less; I saw a straggling specimen of *Colias fieldii* at the same place; and *Papilio machaon* is common at Bagheswar (3,000 feet) in the valley of the Sarju, and even at the crossing of the Rámganga near Gangoliháat a thousand feet lower still. On the other hand, I caught *Terias hecabe* flying over Bireg Mountain at nearly 12,000 feet elevation. The largest range in elevation known to me is that of *Vanessa kaschmirensis*, which I found in the Kali and Sarju valleys at less than 2,500 feet, and again at the summit of the Lepu Lek Pass over 18,000 feet above the sea.

As I spent less than six months in Kumaon, I cannot be sure how many broods of butterflies occur there, or in what months they appear. So far as my four years' experience goes, there are four broods of Indian tropical and subtropical butterflies; two in the wet season—in May or June and in August or early September, and two in the dry season—in October or late in September and in the first warm weather of March—respectively. These periods vary in different localities, the amount of the rainfall being the chief cause of change. In Kumaon, the second wet-season brood, a numerous one, appeared from the middle to the end of August, and the first dry-season brood, less important, especially in the drier valleys, came out in the last week of September, my first specimen of *Mycalesis visala* having been taken September 22nd. In Travancore, there was a small brood of dry-season forms early in March, and a very large one in the second week of May. In Orissa and Ganjam, the first wet-season brood did not appear till the end of July (the monsoon coming late that year), and was poor in numbers. In the Chittagong Hill Tracts, the last dry-season brood, including a vast number of species and of specimens, appeared in the middle of March, while the first wet-season brood, both there and in Arakan, came out at the end of May, and was a very small one. At Bassein, Burma, the first dry-season brood, which, as I have said, appeared in Kumaon near the end of September, was delayed till the middle of November. All butterflies do not have four broods. A few seem to keep coming out at short intervals throughout the year, many are found only in the wet season, and some perhaps only in the dry. It is said that still others are found in but one month of the year, and so have only one brood instead of four. Nevertheless, I think I may generalize my experience into the brief statement that there are four broods, two of the wet, two of the dry season, each of them simultaneous with, or preceding by about a month, the beginning and the end of the season after which I have named them.

Between the two broods of dry-season butterflies (October and March), and between the two broods of wet-season butterflies (May—June and Aug.—Sept.), I have never observed any difference. But between specimens of the wet and dry-season broods there are in many genera very perceptible differences. There is a difference in size, the wet-season specimens being usually smaller, and there are minor differences in the angulation of the wings and in the tone and purity of the colouring below. But the most remarkable difference is in the presence of large eye-like spots on the underside of the wet-season forms, either absent or greatly reduced in those of the dry season. To give an example, the Sarju valley was on September 20th full of ragged specimens of a strongly ocellate butterfly (*Mycalesis mineus* proper), which a week later was succeeded by swarms of a larger, more angulate, non-ocellate insect (*Mycalesis visala*), precisely similar in its structure, and especially in those very complex organs, the prehensores, which in general mark by strong differences the slightest specific variations. In the same way *Melanitis leda* was succeeded by the non-ocellate *M. ismene*, and *Junonia asterie* by the non-ocellate *J. almana*. Such facts are best studied in countries where the wet and dry seasons are very well marked, and there is none better than Travancore, where in 1882—3 I first observed these curious metamorphoses. Hitherto I have only found them to exist in *Junonia*, *Yphthima*, *Melanitis*, and in the following groups of *Mycalesis*:—*Calysisme*, *Orsotriæna*, *Telinga*, *Gareris*, *Virapa*, and *Samanta*. Many genera of the *Satyridæ* seem to produce only the two wet-season broods, and so fail to show what variations the weather would produce in their markings. Again, some dry countries produce only the dry forms, and some wet countries only the wet ones. For instance, I believe that Sindh produces only the dry-weather form, *Junonia almana*, while the wet climate of Ceylon and Singapore produces only *J. asterie*. In dry Orissa, the wet and dry forms of *Orsotriæna medus* and *O. runeka* are tolerably distinct, and *O. runeka* is the commoner of the two. But on the damp Malabar coast, of the representative forms *O. mandata* and *O. mandosa*, the latter, the dry-weather one, is scarce and imperfectly differentiated. The cause of this seasonal dimorphism would be a curious subject of study, but I have no suggestions to offer myself. Mr. de Nicéville has recently observed to me that perhaps, owing to the rank vegetation of the rainy season, the butterflies are better concealed, and have therefore been free to assume these handsome spots, under the influence, perhaps, of sexual selection. This view is I think somewhat strengthened by certain facts. The dry-season forms are all more or less leaflike in shape and colouring, while in the wet-season ones there is no such mimicry. This argues greater exposure to danger in the dry season. Remembering, however, the remarks of Darwin and Wallace on the protective nature of the ocelli of birds, borne out by the testimony of all sportsmen, and observed by me in the case of the common wild peacock, I am inclined to think that the ocelli are a direct protection to the insect during the rains. Certainly that is likely to be the case in the Himalayas, insectivorous birds being especially numerous there during the south-west monsoon, when the ocellate type of butterfly prevails.

For the last three years I have been studying the eggs of Indian butterflies, in the hope of thereby throwing new light on the grouping of these beautiful insects. In this hope I have not been disappointed. In most cases a genus is well and easily defined by its venation, but that venation only very imperfectly expresses the relationship in which it stands to other genera. To define families and subfamilies, one must, I think, study the 'ovation'. For example, the group called by Kirby the subfamily of the *Nymphalinæ* now presents a confused mass of many genera the relations of which *inter se* are extremely vague and uncertain. When the ovation is studied, these genera fall into convenient groups, defined by constant and peculiar forms of egg. I am aware that this classification is not likely to become a popular one: the student will always prefer to separate his genera by an artificial key based on the venation. But that these groups of mine are natural ones, and indicate in most cases the true line of descent, I do not doubt. All considerations of markings, shape, habits, geographical range, and sexual variation indicate the affinity of the genera here placed together.

Unfortunately my work is still very imperfect. The study of the eggs of butterflies is a difficult one. I may state as an example of this, that I examined the bodies of more than forty females of *Melanitis leda* before I obtained a single egg. I was for two years almost equally unfortunate with the much rarer females of *Charaxes*. My method was in all cases to obtain the egg by pressure from the abdomen of the female. Now the egg of some butterflies, including many of the *Satyridæ*, is marked with highly characteristic lines of tubercles appearing some time after it is laid. These I have hitherto been unable to study, and am unable to say whether they extend to the closely allied groups of the *Morphidæ* and *Elymniadæ*. On account of the deficiencies of my early notes, I am not able to place such common genera as *Curetis* and *Loxura*, though from my vague descriptions these genera seem to belong to the *Deudorix* group. Many of the rarer forms I have not yet obtained; the eggs of *Calinaga*, of *Neurosigma*, and of the true *Gerydus* are still unknown to me. Owing to these great imperfections, I have delayed, and shall delay for another year or two, the publication of my studies of the eggs of eastern butterflies. But I take the opportunity to give a short synopsis of the results hitherto obtained, as a kind of *prodromus* or precursor of the perfected work, defining each group as briefly as I can. I omit certain points not yet thoroughly tested, such as the distinction between the *Vanessa* and *Apatura* groups of the *Apaturidæ*. My division of the *Hesperiadæ* is a tentative one. The two last groups, though typically very distinct, show a tendency to coalesce, and I include them under the head of the single subfamily *Baorinæ*, for which name I would willingly substitute *Pamphilinæ*, but for my ignorance of the type of *Pamphila*.

I am not sure that the eggs form a good guide to a *primary* division of butterflies. Even if I were sure, I should hardly have the courage to alter the received classification to the required extent. I have consequently adopted Bates' division by the feet, substituting, for the sake of convenience, Constant Bar's simple and obvious names of *Tetrapoda*, *Heteropoda*, and *Hexapoda*. I do not think, however, that this grouping represents the real relations of the families of butterflies. Judged purely by the egg the classification of butterflies would be something like this :—

1. *Danaiform Group*, including the *Danaïdæ*, *Acræidæ*, and *Heliconiadæ*, connected with the *Apaturidæ* by *Cynthia* and *Cethosia*. (Egg radiate, much higher than wide, leathery).
2. *Satyriform Group*, including the *Satyridæ*, *Elymniadæ*, *Morphidæ*, and *Brassolidæ*, connected with the *Apaturidæ* by *Kallima*. (Egg usually smooth, globular, translucent, hard).
3. *Nymphaliform Group*, including the *Nymphalidæ*, connected with the *Apaturidæ* by *Charaxes*. (Egg reticulate, spiny, soft, with translucent ribs enclosing pentagonal or hexagonal spaces).
4. *Apaturiform Group*, including the *Apaturidæ* and *Eurytelidæ*. (Egg varies greatly, radiate, opaque, rarely much higher or lower than wide, hard).
5. *Lycæniform Group*, including only the *Lycænidæ*. (Egg reticulate, generally not spiny, hard, with opaque white ribs enclosing tetragons).
6. *Pieriform Group*, including the *Pieridæ* and *Libytheidæ*. (Egg radiate, ampulliform, twice as high as wide).
7. *Hesperiform Group*, including the *Papilionidæ*, the *Hesperiadæ*, and probably the *Erycinidæ*. (Egg smooth, prickly or radiate with minute flattened ribs, not so high as wide, opaque, dome-shaped).

The classification here adopted is as follows. I purposely omit all differences except those of ovation. By *radiate*, I mean having ribs diverging from a point at the apex; by *reticulate*, having a plexus of crossing lines bearing no relation to the apex or axis of the egg.

Both sexes with imperfect fore-feet ... ... TETRAPODA.
Male only „ „ „ ... ... HETEROPODA.
Both sexes „ perfect „ ... ... HEXAPODA.

TETRAPODA.

DANAIDÆ. Egg much higher than wide, leathery, radiate, with numerous broad flattened ribs and distinct cross-lines, reticulate over a small area at the apex. Two (*Danais*) or four (*Hestia*) anal tufts in the male.

ACRÆIDÆ. Egg similar, no anal tufts.

SATYRIDÆ. Egg about as high as wide, a little more or a little less, rather small, hard, typically translucent, and smooth or with obscure polygonal facets, sometimes subradiate, or even (*Aulocera*) with distinct, broadly-scalloped, anastomosing ribs, somewhat as in *Hesperia*. In some species it is covered with calcareous (?) accretions which do not appear till after some days' exposure to the atmosphere. Base of costal vein swollen, no præcostal cell. Cell of hindwing closed.

ELYMNIADÆ. Eggs similar, large, globular, translucent, hard, obscurely facetted, nearly as high as wide. Base of costal vein swollen, a præcostal cell in hindwing. Cell of hindwing closed.

MORPHIDÆ. Egg similar, globular, translucent, hard, not so high as wide, smooth (*Discophora*, *Thaumantis*), or obscurely facetted (*Clerome*). Base of costal vein generally not swollen, no præcostal cell. Cell of hindwing open.

APATURIDÆ. Eggs hard, small and numerous (except in the *Euripinæ*), opaque, never much wider than high, sometimes much higher than wide (in the *Cynthinæ*), radiate, with ribs generally slender and acute (except in the *Cynthinæ* and *Argynninæ*), and often serrate. Cross lines not very distinct. Type *Apatura* (*Hypolimnas*) *bolina*.

Subdivisions of the *Apaturidæ*.

KALLIMINÆ. Egg obsolescently radiate, as high as wide, somewhat *Morpho*-like.

CYNTHINÆ. Egg as in *Danais* but hard, much higher than wide. These two groups are aberrant, and should perhaps form separate families.

ARGYNNINÆ. Egg as high as wide or higher, ribs rather numerous, heavy, blunt, anastomosing, projecting at apex, with numerous distinct cross lines.

APATURINÆ. Egg not so high as wide, ribs few, sharp and prominent, usually projecting at apex, and often serrate.

EURIPINÆ. Eggs large, few, hardly as high as wide, ribs low, serrate, rather numerous, not produced at apex. The group seems somewhat transitional to the *Charaxidæ*.

EURYTELIDÆ. Eggs radiate, small, numerous, hard, nearly as high as wide, with radiating lines of erectile bristles. The *Eurytelidæ*, though I think them nearer to the *Apaturidæ* than to any other group, interrupt the sequence of the families.

CHARAXIDÆ. Eggs large, few, globular, hard, not so high as wide, with obscure ribs and cross-lines at the base only, forming (usually) tetragons, with minute projecting points at their intersection. *Charaxes* seems to connect the *Apaturidæ* with the *Nymphalidæ*.

NYMPHALIDÆ. Eggs very large, few, soft, not so high as wide, trongly reticulate with elevated, translucent, chitinous (?) lines crossing the surface asymmetrically, enclosing pentagonal and hexagonal spaces, and bearing long, acute, often bifid spines at their intersection. This group is a large and, so far as the eggs go, a very homogeneous one, but the caterpillars vary greatly. Type *Nymphalis* (*Limenitis*) *populi*.

HETEROPODA.

LYCÆNIDÆ. Eggs hard, small, numerous, much wider than high, reticulate, with a whitish, calcareous (?) accretion forming an asymmetrical network of tetragons.

Subdivisions of the *Lycænidæ*.

AMBLYPODINÆ. Egg at least half as high as wide, convex above, widest well above the base, with numerous delicate intersecting ridges bearing acute spines at their crossing.

DEUDORIGINÆ. Egg similar, with short, truncate spines. Clasps (*harpagones*) small, aborted, attached immoveably to the projecting intromittent organ.

THECLINÆ. Egg fully half as high as wide, convex above, widest close to the base, with coarse, minutely vesicular reticulations forming large irregular pits over the surface, and bearing broad, depressed tubercles at their intersection.

LYCÆNINÆ. Egg less than half as high as wide, concave above, "turban-shaped" (as Mr. Scudder calls it), widest above the middle, reticulations coarse and asymmetrical.

PORITINÆ. Egg hexahedral, otherwise similar. This is the only egg known to me that is not round in horizontal section. I hope to figure this extraordinary form in my forthcoming article on this subject.

GERYDINÆ. Egg less than one-third as high as wide, delicately and sometimes obsolescently reticulate, sometimes carinate, flat above and below.

ERYCINIDÆ. Egg not so high as wide, smooth, granulate or prickly, neither reticulate nor radiate in the few genera examined by me.

LIBYTHEIDÆ. Egg ampulliform, shaped like a soda-water bottle, twice as high as wide, forming a short neck or stalk close to the apex, radiate, with strong and anastomosing ribs. Palpi long, pupa suspended. Of the affinity of this remarkable genus with the *Pieridæ* I have no doubt. Westwood remarks on the similarity of their larvæ.

HEXAPODA.

PIERIDÆ. Egg as in the *Libytheidæ.* Palpi short, pupa girt.

PAPILIONIDÆ. Egg dome-shaped, smooth or obscurely facetted, not so high as wide, somewhat leathery, opaque. The egg of *Parnassius*, in my opinion, is that of a true papilionid, though Mr. Scudder compares it with those of the *Lycænidæ*.

HESPERIADÆ. Eggs very large, very few (except in the first group), only one or two matured at a time; opaque, dome-shaped, smooth; or with delicate, depressed serrate ribs, few or very numerous, and with distinct cross lines.

Subdivisions of the *Hesperiadæ*.

HESPERINÆ. Egg small, hard, seven-eighths as high as wide or even higher, constricted at base, with wide, scalloped, anastomosing ribs. This group is very distinct. The only Indian genera belonging to it are *Hesperia (Pyrgus)* and *Gomalia*.

SUASTINÆ. Egg lower, dome-shaped, large, hard, constricted at base, with a few broad depressed, delicate, biserrate ribs. This group does not seem to be represented in Europe or North America.

BAORINÆ. *Cyclopides*-Group. Egg similar, two-thirds as high as wide, constricted at base, with very numerous slender ribs.

BAORINÆ. *Baoris*-Group. Egg half as high as wide, leathery, limpet-shaped, widest, and often carinate at base, smooth, generally overlaid with pigment above, as in many *Papilios*, sometimes with numerous obsolete ribs. This group seems to be equivalent to the *Astyci* as defined by Scudder.

In the following list I have given the exact localities of all the rarer butterflies that I caught in Kumaon, and I have endeavoured briefly to indicate the range of most of the species in height. The figures given are however very uncertain, representing but a limited experience. In most cases I have given a rough estimate of the height of the highest and lowest points at which I have taken the species, making allowance, in a few very common kinds, for "straggling." The fauna of the district changes considerably as one goes from west to east. On the west, the Pindari Valley forms a part of the Garhwál river-system, and its butterflies are distinctly those of the North West Himálayas. The successive river-valleys to the eastward thence partake more and more of the nature of the Eastern Himálayas. Some Sikkim forms seem to extend westward to the Sarju or the Rámganga and no farther. And a very large number seem bounded by the Káli, the river separating Kumaon from Nepál. The valley of this river forms a genuine zoological boundary. Among the species that seem to extend no farther west, are *Papilio paris*, *Melanitis zitenius*, *Elymnias leucocyma*, *Symbrenthia hypselis*, *Neptis vikasi*, *Euthalia apiades* and *E. lubentina*, and such genera and subgenera as *Dyctis*, *Rohana*, *Dichorrhagia*, *Moduza*, *Haridra*, *Zemeros*, *Chersonesia*, *Chliaria*, *Remelana*, *and Cheritra*. Three larger groups, the family of the *Morphidæ* and two aberrant divisions of the *Lycænidæ* (the *Gerydinæ* and the *Poritinæ*), seem to extend no farther west than the Káli and its branch the Sarju.

A few remarks may be permitted on the curious habits of the larvæ of certain *Lycænidæ*. Dr. Thwaites (in Moore's "Lepidoptera of Ceylon") has the following remarks on the subject, "Nature, however, finds a protection for these said helpless individuals" [larvæ of *Lycænidæ* unspecified] "in the instincts of a species of ant (*Formica smaragdina*, Fabr.), which finding a substance most palatable to it secreted naturally from a glandular defined spot upon the bodies of these helpless larvæ, takes possession of them as 'cows,' surrounding each separate one, and the leaf on which it feeds, with a few silken strands of its web, protecting them jealously and attacking most fiercely any living thing intruding upon them." Besides a remark of Herrich Schäffer's, quoted in Distant's "Rhopalocera Malayana," that *Gerydus symethus* inhabits ants' nests, I have met with no other mention of this singular habit. I have myself observed it in quite a number of Indian *Lycænidæ*, belonging to several distinct groups, and feeding on the leaves of various trees and herbs. My observations are still in progress, and I reserve for a future occasion a fuller account of them, and descriptions of the larvæ on which they have been made. The larvæ in question are all very helpless and inactive grubs, sluglike in shape, tapering at both ends, pubescent, green or brown, with a very small retractile head. On each side of the penultimate segment above, there is a short protuberance, from which can, in most cases (*e. g.*, *Tarucus theophrastus*), be extended a brush of hairs (apparently absent in some species, *e. g.*, *Azanus ubaldus*). This is, I have no doubt, a scent-gland, and may be intended to attract the notice of the purblind ants. On the dorsal line of the preceding segment, the eleventh, there is another short tubercle exuding a viscid juice. It exists in all the *Lycænidæ* known to me, whether they are maintained by ants or not, and from it issues a gummy thread by the aid of which I believe the caterpillars sometimes swing themselves from branch to branch, or attach themselves to leaves. But though in all probability acquired for such purposes, it is peculiarly attractive to the ants, which at all hours surround the poor caterpillar and, by stroking and tickling it with their antennæ, induce it to yield up this sweet (?) liquid. I have not yet found any caterpillar in the possession of web-making or arboreal ants such as *Formica smaragdina*, and no restraint such as Dr. Thwaites mentions was placed upon any larva observed by me. But the ants would always remain near the caterpillar, and would always fly fiercely to the rescue if anything molested it. When it had attained its full growth, the ants, forming a circle round it, would forcibly drive it down to their nest at the foot of the tree. This sight is rather an amusing one, the caterpillar often showing the greatest reluctance to leave its pasture-ground, and manifesting strong doubts as to the intentions of its escort. I was struck with the forbearance and patience of the ants, which carefully abstained from any violent use of their formidable jaws, though the journey was thereby sometimes prolonged to six or seven hours. Having arrived at the foot of the tree, the ants deposited the caterpillar in an open space just within the mouth of the nest, whereupon the latter immediately attached itself to the bark, and commenced its transformations. I have counted as many as thirteen chrysalids of *Azanus ubaldus* so attached in one nest at the foot of a kind of bábul tree (*Acacia leucoplœa*). All were uninjured and all produced perfect butterflies. The instinct which induces the ants to preserve these caterpillars in their nests, thus sacrificing a large present supply of food to the possibility of a future supply of the sweet juice they are so fond of, strikes me as one of the most remarkable things in nature.

A kind of hermaphroditism seems to occur sometimes in the *Hesperiadæ*. From the body of (apparent) males of *Suastus eltola* and of *Coladenia dan*, both having perfect prehensores of the form characteristic of their respective species, I obtained one or two well-developed eggs exactly similar to those taken from the females of the same species. Also, from a male of *Suastus toona* (the egg of that species being, except for this, unknown to me) I obtained a single immature blood-red egg. I have not observed this in any of the higher groups of butterflies.

My thanks are due to the Superintendent of the Indian Museum, Calcutta, who has given me the freest access to the fine collections under his charge; and to Mr. de Nicéville, who has given me the benefit of his advice and assistance on several difficult points.

Suborder RHOPALOCERA TETRAPODA, Constant Bar.

Family DANAÏDÆ, Felder.

1. DANAIS AGLAÏA, Cram. (*aglea*) = *melanoïdes*, Moore. Common in the Tarai and in the Sarju and Káli valleys up to 4,000 feet.

2. DANAIS LIMNIACE, Cram. Ránibágh at the foot of the hills.

3. DANAIS SEPTENTRIONIS, Butler. Sarju and Káli valleys, 2—4,000 feet.

4. DANAIS TYTIA, Gray. Pindari, Gori, Sarju, and Káli valleys, 3—6,000 feet. Mimicked by *Hestina nama*.

5. DANAIS CHRYSIPPUS, Linn. Ránibágh, Káli valley to Dhárchula (3,000 feet), not common.

6. DANAIS GENUTIA, Cram. Common everywhere, up to Kháti, 7,000 feet.

7. EUPLŒA MIDAMUS, Linn. = *linnæi*, Moore. Káli valley to Dhárchula, Gori, and Sarju valleys, 2—4,000 feet, common.

8. EUPLŒA CORE, Cram. Common as high up as Kháti, 7,000 feet.

Family ACRÆIDÆ, Doubleday.

9. PAREBA VESTA, Fabr. Common locally, 4—5,000 feet. Taken on the Dhoaj, 6,500 feet.

Family SATYRIDÆ, Swainson.

10. MYCALESIS (GARERIS) SANATANA, Moore. The non-ocellate dry-season form, Askot, 5,000 feet, October. The ocellate, wet-season form (*gopa*, Felder), Rámgarh and Tákula, Western Kumaon, 5,500—6,000 feet, August, rare.

11. MYCALESIS (CALYSISME) PERSEUS, Fabr. The dry-season form, first seen on the Lower Gori, 2,500 feet, September 29th; also in the Káli valley and the Bhábar, 1—3,000 feet. The wet-season form (*blasius*, Fabr.) common in the same localities, Aug.—Sept.

12. MYCALESIS (CALYSISME) MINEUS, Linn. Wet-season form, commoner than the preceding species in all the valleys up to 5,000 feet, Aug.—Sept. The dry-season form (*visala*, Moore) first seen on the Lower Sarju, about September 23rd. Caterpillar taken by me at 10 P. M. in a meadow at Sonakala, Southern Orissa. It is fusiform, brownish-green, tapering greatly at both ends. Head rather large, finely pubescent, dark fuscous marbled with paler, a smooth plate in the middle of the forehead, two short, rough triangular horns. Neck greatly constricted. Body rough and prickly rather than pubescent, finely wrinkled transversely, six wrinkles to each segment, the second twice as broad as the others. A faint darker dorsal line chiefly visible posteriorly, a lateral line of oblique dark streaks, one to each segment. Last segment prolonged and ending in two rough, triangular, slightly divergent horns. It has the habit of resting for hours with its chin strongly retracted, and its horns projecting forwards. The fourth eye from above is very much larger than the others, and the head with its short, ear-like horns looks very much like a cat's. The larva of *Melanitis* has on the contrary the horns long and slender, and the eyes subequal. Before undergoing its metamorphosis, the larva of *mineus* became in colour a clear transparent green (like the normal colour of that of *Melanitis*), unmarked except by the black dots of the spiracles.

Chrysalis green, smooth, its envelope transparent, shorter and thicker than the chrysalis of *Melanitis*, strongly constricted between the thorax and abdomen. The period varied in my specimens from five days and six hours to six days and eight hours.

The caterpillar feeds on various grasses. That of *Melanitis* I always captured on young growing rice. Both are strictly nocturnal.

13. Mycalesis (Samanta) malsara, Moore. Wet-season form, Káli, Gori, and Sarju valleys, 2—4,000 feet, Aug.—Sept. Dry-season form (*lepcha*, Moore) Lower Káli valley, 3,000 feet, November, rare. My specimens, both ocellate and non-ocellate, all have the white band below very narrow, whereas the usual form of the species in Sikkim has it wide. The dry-season form of this latter variety is *rudis*, Moore, which I have taken abundantly in the Chittagong Hill Tracts.

14. Mycalesis (Samanta) heri, Moore. My two specimens from Kápkot and Baghribát, 2—5,000 feet, differ from a Sikkim specimen in the Indian Museum, Calcutta, in having the band below almost obsolete. One has only two ocelli on the forewing below, the other has two additional smaller ones between them. Both have only two ocelli on the hindwing above. I have also the dry-season form (one male, Jhulaghát, 2,000 feet), lacking the ocelli below, but otherwise similar, especially in the prehensores. Those who do not accept the doctrine of the seasonal variation of the *Satyridæ* will consider this a new species. In the same way *nicotia*, Hewitson, is represented in the dry season by *langii*, de Nicéville.

15. Lethe europa, Fabr. Ránibágh at the foot of the hills, 1,000 feet.

16. Lethe dyrta, Felder. Lower Himálayan tract, 3—6,000 feet.

17. Lethe hyrania, Koll. Kumaon generally, 3—7,000 feet. My specimens are somewhat transitional to *dinarbas*, being quite as dark, and tinged with lilac in certain lights. These two probably form one species.

18. Lethe maitrya, de Nicéville. Dhánkuri, Khati in Western, Sosa in Eastern, Kumaon, 7,000—11,000 feet. (Upper Himalayan tract.)

19. Lethe sidonis, Hew. Naini Tál, 6—7,000 feet, small specimens, a large dark variety at Kháti, N. W. Kumaon, 7—8,000 feet.

20. Lethe vaivarta, n. sp., allied to *nicetas* and *sidonis*. Dhankuri, Kháti, Dwáli, N. W. Kumaon; near Khela, East Kumaon, 7—11,000 feet.

Shape of wings very much as in *sidonis*, except that the angle at the upper median branch of the hindwing is obsolescent, those at the ends of the lower median branches being more produced. Wings wider and costa more bent than in *nicetas* and *maitrya*. Lustrous brown, cilia alternately dark and pale. Two dull ochreous spots on costa of forewing.

at $\frac{1}{5}$ and $\frac{3}{5}$ from apex respectively, more distinct in the female. Faint traces of a pale transverse band in continuation of the inner spot. *Hindwing* with five distinct black spots, the last smallest, extending from the first subcostal to the lower median, encircled in the female by pale bronzy rings. *Below, forewing* basally fuscous brown, becoming paler and more reddish apically, an irregular dark line obliquely from middle of costa to the submedian vein near the lower angle of the wing, separating the dark base from the pale outer portion. Along its outer edge a strong ochre band extends from the costa to the upper radial, thence faintly marked as a pale band, angulate, but not broken as in *nicetas*. A subapical pale band from the costa, where it is ochreous, to the upper median, containing four dark spots pupilled with whitish dots. Cell with a pale band across it a little beyond the middle. *Hindwing* with four broken irregular lilac lines across base and disc besides two short ones defining the discocellular veins. The outer line is bordered by a very angular dark brown band, widest from costa to upper median, where it is acutely angled; a faint trace of ochreous beyond its upper portion. Cell crossed by three lilac lines besides those at the end. Ocelli seven, all set in lilac rings, and forming a curved line much as in *sidonis;* the anal two small and set in the same lilac ring, the 2nd, 3rd, and in a less degree the 4th strongly blurred, their lilac rings being also somewhat diffused, especially in the female. The other ocelli are distinct, pupilled with white. A continuous marginal line of dull reddish ochreous, bounded by a slender black line within and without; along its inner edge a wavy band of bright lilac narrowed at the veins and extending from the upper median to the submedian vein.

This species is more variegated in colour than *sidonis*, and less than *nicetas;* the 2nd, 3rd, and 6th ocelli are always blurred, and the 1st, 5th, 6th, and 7th perfect, thereby differing from *maitrya* (in which they are all blurred), from *nicetas* (in which they are all perfect), and from *sidonis*, in which the 2rd and 4th are slightly blurred. From *sidonis*, its nearest ally, it also differs in the ochreous marks on the forewing above and below, and in the distinct black spots of the hindwing above. Prehensores close to those of *sidonis*. The uncus, however, is more bent down, appearing truncate from above and flattened laterally, while in *sidonis* it appears acute from above and is cylindrical. In both species the uncial branches viewed from the side are distant from the uncus, and much shorter, and come to meet it at an angle, while in *maitrya* the uncus and its branches are nearly equal, nearly parallel, and approximate. The clasp also, is simply hooked instead of being set with numerous barbs as in *sidonis* and *vaivarta*.

21. LETHE (TANSIMA) VERMA, Koll. Lower Himálayan tract, 2,500—6,000 feet, not very common.

22. LETHE (TANSIMA) ROHRIA, Fabr. Lower Himálayan tract, 2,500—7,500 feet, common. The subcostal veins of these two species are differently arranged, but they agree in the very broad cell of the forewing, in the white apical stripe common to both sexes, in the first ocellus of the hindwing below being withdrawn from the series, and, as regards the prehensores, in the curiously palmate branches of the uncus.

23. LETHE (ZOPHOESSA) JALAURIDA, de Nicéville. Dhánkuri, Kháti, Dwáli, North-West Kumaon, 7—11,000 feet. The female only differs from the male in its larger size, broader wings, and somewhat paler markings.

24. LETHE (ZOPHOESSA) GOALPARA, Moore. Dhánkuri, Kháti, 7—9,000 feet.

Subgenus CHARMA, nov. Forewing, outer margin straight or slightly convex, cell rather short and broad, upper radial from the end, 2nd and 3rd subcostals from just before the end, of the cell, approximate, discocellulars slightly convex. *Hindwing* narrow, almost equally angled at the first and third median branches. The apical angle obsolescent, that at the 1st subcostal more distinct, the lower discocellular joining the median just before its last bifurcation. A glandular patch of peculiar black scales on the hindwing of the male in the space between the costal and subcostal veins, extending into the cell and just within the fork of the 1st and 2nd subcostals. By this patch, and by the displacement of the first ocellus of the hindwing behind the line of the others, this group may be distinguished from other *Lethe*. What I regard as of more importance is the extraordinary structure of the prehensores; the uncus (which is provided with rather short and slender branches) being cleft into two strong lobes lying in the same vertical longitudinal plane, and resembling the open claw of a lobster, the lower point being slightly the longer, a structure unknown among all other tetrapod butterflies. Type *baladeva*. The genus probably includes *andersonii*, Atkinson, and perhaps other species.

25. LETHE (CHARMA) BALADEVA, Moore. Pindari Valley, 7—8,000 feet, darker than Sikkim specimens, the silver bands narrower.

26. LETHE (NEOPE) PULAHA, Moore. Kháti, Kápkot, 7—8,000 feet, rare.

27. RHAPHICERA MOOREI, Butler. Dhánkuri, Kháti, Dwáli, Chaudáns, 7—11,000 feet. The female only differs in its larger size, slightly paler colouring, and broader wings.

28. AMECERA SCHAKRA, Koll. Kumaon generally up to 9,000 feet, seen as low as Dhárchula, 3,500 feet.

29. AULOCERA PADMA, Koll. The female described by Kollar is evidently of the same species as Moore's male type of *avatara.* Kollar's description and plate are unmistakeable. There are, however, two allied species now passing under the name of *padma.* Of the true *padma* I have both sexes from Nárkanda near Simla and from the Galis north of Mari, but in Kumaon I obtained only females, taken in October and November in the Kali Valley, ranging from 7,000 feet at Juti in Chandans to 2,500 feet at Garjiaghát and even lower. This species is much the larger of the two; my females are all over four inches spread. The cell of the forewing is covered with long shining hair; the male mark on the forewing is more distinct, the male lacks the white spots diverging to the costa from the macular band; in the female these are three in number, and rather blurred. The female has the surface below heavily striated with whitish; the band is not at all definite outwardly and is nearly white in colour.

30. AULOCERA LOHA, n. sp., is the other form of *padma.* Smaller, cell of male smooth, sex-mark not very plain, male distinguished by the divergent white spots from the median band to the costa, the female by the band of the hindwing below being narrow, well-defined, and ochreous. This insect is darker than the other, the apex of both wings glossed with lilac below, and the base of the hindwing greenish. It may perhaps be only a seasonal form of the preceding species. I am unluckily unable to compare the prehensores, having no drawing of those of *padma.* I found *loha* common on Bireg mountain, North-West Kumaon, in August and September, 9—12,000 feet, the species thus occurring at the same elevation as *brahminus*, the prehensores of which are altogether different. The *padma* from Sikkim mentioned (P. Z. S. 1882) by Mr. Elwes are of this species.

31. AULOCERA SWAHA, Koll. Found on all the hills of the Pindari district 7—10,000 feet, also on the outer ranges, Jágheswar, Tákula and the Dhoaj, 5,500—9,000 feet, and in Chaudáns in East Kumaon, 5—7,000 feet. A common species. I did not obtain the form which has the band of the forewing bright yellow.

32. AULOCERA BRAHMINUS, Blanch. Pindari District, 10—12,000 feet, not very common.

33. AULOCERA SCYLLA, Butler. Pindari Glacier, and Mount Byeri above Furkya, North-West Kumaon, 12—14,000 feet, Garbyán, 12,000 feet, Lepu Lek, 16,000 feet, North-East Kumaon. The prehensores are distinct from those of *brahminus.* The latter has the uncus, seen from above, longer and its branches more slender. Seen from the side, *scylla* has the uncus and its branches parallel and nearly in the same horizontal plane, and the top of the uncus is knobbed, while in *brahminus* it is

smooth and the branches diverge downwards from it. The clasp has its upper limb toothed horizontally, in *scylla* vertically. Colonel Lang's type of *werang* seems to me only a small *brahminus* from high elevations. Mr. Butler's *scylla* I have not seen. The present species is small, ochreous-gray below, with a discal line of white spots on the hindwing below, the band there crooked; on the forewing below, the ocellus is pupilled with white and the band is wide and united. I have caught it flying with *brahminus*, from which I consider it distinct, in the meadows near Furkya.

34. AULOCERA SARASWATI, Koll. Pyura, above Loharkhet, the Dhoaj, Takula, 5—9,000 feet. It is the most distinct of the *Aulocera*. The egg has 23 ribs, that of all the other *Aulocera* having 26—28.

35. ŒNEIS PUMILUS, Feld. A single female found on the moist ground at the edge of the snow-line on the northern side of the Lepu Pass, Chinese Tibet, 17,000 feet.

36. CALLEREBIA SCANDA, Koll. Above Loharkhet, Kháti, Dhankuri, N. W. Kumaon, 7—11,000 feet.

37. CALLEREBIA HYBRIDA, Butler. Kumaon generally, 6—9,000 feet. Probably the wet-season brood of *annada*.

38. CALLEREBIA NIRMALA, Moore. Two males, above Loharkhet, 7—8,000 feet.

39. CALLEREBIA ANNADA, Moore. Kumaon generally, 5—7,000 feet. First specimens taken Sept. 22nd. The above forms are easily separated, but the differences can hardly be called specific. Except in *scanda* the prehensores are very similar in all. The next species is very distinct.

40. CALLEREBIA HYAGRIVA, Moore (*Yphthima hyagriva*). The venation of the forewing shows this species to be a true *Callerebia*, both the 1st and the 2nd subcostals being emitted before the end of the cell. The structure of the prehensores shows the same thing. All the *Satyridæ* known to me, except *Yphthima* and *Melanitis*, have the uncus branched, and in *hyagriva* this part is branched precisely as in other *Callerebia*. The prehensores are scarcely to be distinguished from those of *annada*. I found *hyagriva* not uncommon at various points in Kumaon, 3—7,000 feet, during the rains.

41. YPHTHIMA (more properly IPHTHIMA) NAREDA, Koll. Kumaon generally up to 9,000 feet, common. This species is somewhat transitional to *Callerebia*. The uncus is not exactly lobed, but flattened out horizontally like a tile, appearing from above very broad and square-cut.

42. YPHTHIMA SAKRA, Moore (= *nikæa*, Moore). Kumaon generally, 3,000—11,000 feet, common in the higher regions, varies greatly.

43. YPHTHIMA ASTEROPE, Klug. (= *ariaspa*, Moore), Bágheswar, Tákula, Lower Sarju, Lower Gori, 2,000—6,000 feet.

44. YPHTHIMA HUEBNERI, Kirby. Bágheswar, Rámbagh, Kápkot, 1,000—4,000 feet.

45. YPHTHIMA SINGALA, Felder. Bágheswar, Kápkot, Tákula, Lower Sarju, 2,000—6,000 feet. Fresh specimens have faint traces of a male mark on the forewing above, as in *philomela*. The forewing above is always ocellate in the female, non-ocellate in the male. I found an allied species, ocellate in both sexes, common at the extreme summit (5,000 feet) of Mahendragiri, Ganjam district, Eastern Gháts, and perhaps identical with *thora*. The form I call *singala* is common in many parts of India; I am not sure of its identity with the Ceylonese species.

46. YPHTHIMA AVANTA, Moore. River-valleys generally, 2,500—5,000 feet. The sex-mark is more prominent than in *singala*. Ocellus on forewing above sometimes obsolete in the male.

47. YPHTHIMA PHILOMELA, Joh. Valleys up to 6,000 feet. The sex-mark is very prominent. These seven species are all very distinct, and all have the prehensores differently formed. The dry-season forms are all more or less non-ocellate. That of *sakra* is still unknown to me. The seasonal forms are not so well separated in *Yphthima* as in *Mycalesis*.

48. MELANITIS LEDA, Linn. Wet-season form, Tarai and low valleys up to 4,000 feet, August—September. Dry-season form (*ismene*, Cram.), same localities, October—November. This species is hardly distinct from the next two. The prehensores, which in this family and in the *Lycænidæ* are almost infallible tests of species, here show no good distinctions.

49. MELANITIS ZITENIUS, Herbst. Káli valley, 2—4,000 feet.

50. MELANITIS BELA, Moore. Wet-season form, Baghrihát, Káli Valley, 2,500 feet, rare. Dry-season form (*aswa*, Moore), Toli, Káli Valley, 2,500 feet, rare. I consider *tristis*, Felder, *suyudana*, Moore, and *abdullæ*, Distant, all synonyms of this species.

Family ELYMNIADÆ.

51. ELYMNIAS UNDULARIS, Dru. Ránibagh at the foot of the outer hills, 1,000 feet.

52. ELYMNIAS LEUCOCYMA, Godt. Káli valley at Balwakot and Toli, 2,500—3,000 feet. Compared with Sikkim specimens they are more striated and speckled with white below, and as in *patna* they all have an irregular line of whitish spots round the outer disc of the hindwing above.

53. DYCTIS PATNA, Westw. Two males, Garjiaghát, near the junction of the Káli and the Gori, Eastern Kumaon, 2,500 feet. They do not differ from Sikkim specimens.

Family MORPHIDÆ, Westwood.

I did not capture any morphid in Kumaon, but in the great gorge of the Sarju below Kápkot, I observed several specimens of a magnificent new species, probably an *Amathusia* or a *Zeuxidia* (I think I noticed the acuteness of its wings), and an excellent mimic of *Euplœa midamus*, which was common there. They had the true morphid flight, and always settled on the underside of leaves with folded wings. I spent half the day in trying to catch them, but was unsuccessful, owing to the dangerous and precipitous nature of the place.

Family APATURIDÆ, Boisduval.

Subfamily KALLIMINÆ.

54. KALLIMA INACHUS, Boisd. (*inachis*). River valleys, 2—5,000 feet.

Subfamily ARGYNNINÆ.

55. CUPHA ERYMANTHIS, Drury. River valleys up to 5,000 feet.

56. ATELLA PHALANTA, Drury. Tarai and hills to 6,000 feet.

57. ATELLA SINHA, Koll. Káli valley, 2—3,000 feet, common.

58. ARGYNNIS ISSÆA, Gray. The dark basal area on the hindwing above is broad and undefined; the submarginal dark band of the hindwing below is distinctly broken by an ochreous space between the radial and the upper median. In these respects it differs from *latonia*, Linn. (*lathonia*). The prehensores also seem tolerably distinct. The species is common all over Kumaon from Bágheswar (3,500 feet) in the Sarju valley to the Lepu Lek, 16,000 feet. At very high altitudes the specimens are small.

59. ARGYNNIS CHILDRENI, Gray. Naini Tal, Kháti, 6,000—8,500 feet.

60. ARGYNNIS KAMALA, Moore. Dhánkuri, 10,000 feet.

61. ARGYNNIS JAINADEVA, Moore. Pindari Valley, 9,000 feet, rare.

62. ARGYNNIS NIPHE, Linn. Lower Himalayan region from the Káli valley, 2,500 feet, to Almora and above Pithoragarh, 6,000 feet.

Subfamily APATURINÆ.

Vanessa-Group.

63. VANESSA KASCHMIRENSIS, Koll. From the Káli valley (2,500 feet) to the summit of the Lepu Lek, over 18,000 feet, far above the snow line. I also found it abundantly in Nepalese Tibet and in the dry valleys of Hundes (Chinese Tibet). The prehensores as drawn by me are different from those of *urticæ* figured by Dr. Buchanan White.

64. VANESSA LADAKENSIS, Moore. Near Kálápáni, Nepalese Tibet, 14,000 feet; another near Hindi, Chinese Tibet, 15,000 feet. The prehensores are quite different from those of *kaschmirensis.*

65. VANESSA CANACE, Linn. (*charonia*, Drury). Kumaon generally, 2,500—8,000 feet, rather scarce.

66. GRAPTA C-ALBUM, Linn. Kháti, N. W. Kumaon, 8,000 feet. Resembles my Mari specimens very closely.

67. GRAPTA AGNICULA, Moore. Pindari Glacier, 12,000 feet, Byáns valley, Eastern Kumaon, 12—15,000 feet. These species are closely allied, but I have been able to separate my own specimens by means of slight differences in the prehensores as well as by the shape and colouring. But I do not find the prehensores absolutely constant in the first three genera of this group.

68. PYRAMEIS INDICA, Herbst. Kumaon generally, 2,500—10,000 feet.

69. PYRAMEIS CARDUI, Linn. Ranging from Dhárchula (3,000 feet) to 16,000 feet on the Lepu Lek.

70. CYRESTIS THYODAMAS, Boisd. Kumaon generally, 2,000—8,000 feet, called the "map butterfly" by European collectors. The occasional yellowish specimens are perhaps cases of atavism, indicating descent from a red *Cyrestis.*

71. CHERSONESIA RISA, Doub. Káli valley, 2—3,000 feet. Kumaon specimens are lighter in colour and more delicately marked than Sikkim ones. Three of the bands below are in both sexes beautifully glossed with lilac on the hindwings and to a less extent on the forewings.

72. SYMBRENTHIA HIPPOCLUS, Cram. Low country and river-valleys, as far up as the Dhoaj, 6,500 feet, common. I have also found it in the Eastern Gháts of the Indian Peninsula, in the districts of Ganjam and Vizagapatam.

73. SYMBRENTHIA HYPSELIS, Godt. Káli valley, Eastern Kumaon, 2—4,000 feet, common.

74. SYMBRENTHIA ASTHALA, Moore. Pindari valley, N. W. Kumaon, 7,000 feet. The undescribed *female* differs from the male in the red markings above being paler, the apical band wider and longer, extending from the extreme costa almost to the outer margin, approaching the discoid band, remote from the lower band, having a deep sinus on its lower side and a streak given out upwardly from its outer end. Lower band of forewing broad, its upper part clavate, displaced outwardly above the lower median, discoid band irregular, heavy, its end produced below the middle median branch. Lower band of hindwing extends only to the second subcostal, with only a trace of a submarginal line beyond it. *Below*, nearly uniform orange-tawny, the base

of both wings and costa of forewing paler ochreous. The prehensores of these species are interesting. In *hypselis* the clasp seen from the side is curiously bent upwards in the form of the figure 2. In *asthala* the shape is still more bizarre, the tip bending down so as almost to form a complete circle. The base of the clasp is also more square, and the uncus more slender.

75. SYMBRENTHIA HYSUDRA, Moore. Pindari valley, N. W. Kumaon, 5—8,000 feet. The female is much like the male, but all the red markings are larger and more confluent. The prehensores are very different from those of the preceding species, the uncus having strong branches nearly as long as itself, and the clasp, seen from the side, being square-cut, with a short horizontal projection from its upper angle.

Junonia-Group.

76. JUNONIA ORITHYIA, Linn. Kumaon generally, plains to 6,000 feet.

77. JUNONIA LEMONIAS, Linn. Kumaon, plains to 6,000 ft.

78. JUNONIA ŒNONE, Linn. Kumaon generally, taken up to 7,000 ft.

79. JUNONIA ATLITES, Joh. (*laomedia*). Ránibágh and the Tarai, 1,000—2,000 feet, scarce.

80. JUNONIA ALMANA, Linn. The dry-season form. I have no doubt that it is conspecific with *asterie*, Linn., the wet-season form. Both are found in the Sarju and Káli valleys, 2,000—4,000 feet, and in the Tarai. The prehensores are the same in both.

81. PRECIS IPHITA, Cram. Everywhere common, as high up as Kháti, 8,000 feet. The wet-season brood consists of very pale specimens; the autumn brood, appearing at the end of September, is much darker.

82. PSEUDERGOLIS VEDA, Koll. (*wedah*). Sarju, Káli, and Gori valleys, 2,000—5,500 feet.

83. ROHANA PARYSATIS, Westw. (*parisatis*). One male, seen at Jhulaghát, eastern border of Kumaon. The genus is allied to *Precis*.

Apatura-Group.

84. APATURA (or HYPOLIMNAS) BOLINA, Linn. Tarai, 1,000 feet. Specimens from the forests of the Káli valley (2,000—4,000 feet) approach *jacintha*, Drury.

85. APATURA (or HYPOLIMNAS) MISIPPUS, Linn. Almora, 6,000 feet, Lower Gori, 2,500 feet.

86. STIBOCHIONA NICÆA, Gray, (*nicea*). Sarju, Gori, and Káli valleys, 2—5,000 feet.

87. DICHORRHAGIA NESIMACHUS, Boisd. One female in bad condition, Káli valley, near Jhulaghát, Nepál. I am not certain as to the position of this genus, never having examined the egg.

Subfamily EURIPINÆ.

88. SEPHISA DICHROA, Koll. Loharkhet, N. W. Kumaon, Askot, E. Kumaon. Much darker than Kulu or Simla specimens. The black discal band across the hindwing below is especially wide, so as wholly to enclose the whitish spot between the lower medians. The veins are also heavily marked with black. At Mari, in the extreme north-west of India, I found this species with the band on the hindwings below wholly obsolete, and the underside with a whitish, silky gloss.

89. HESTINA NAMA, Doub. Káli, Sarju, and Gori valleys, from 2,000 almost to 6,000 feet. The outer part of the hindwing above is somewhat darker than in Sikkim specimens, and the ground-colour more distinctly greenish.

90. EURIPUS CONSIMILIS, Westw. Jhulaghát, East Kumaon, two females only.

Family EURYTELIDÆ, Westwood.

91. ERGOLIS MERIONE, Cram. Gori and Káli valleys, 2—4,000 ft.

92. ERGOLIS ARIADNE, Linn. Ránibágh and the Tarai, 1,000 feet.

Family CHARAXIDÆ.

93. CHARAXES FABIUS, Fabr. Ránibágh at the foot of the hills.

94. CHARAXES (EULEPIS) ATHAMAS, Drury. Sarju, Káli, and Gori valleys, 2—4,000 feet.

95. CHARAXES (EULEPIS) EUDAMIPPUS, Doub. *Seen*, Jhulaghát on the Káli, no doubt as to the species.

96. CHARAXES (HARIDRA) LUNAWARA, Butler. Lower Káli, rare.

97. CHARAXES (HARIDRA) HEMANA, Butler. Kapkot on the Sarju, perhaps the western limit of the group. Also, Gori and Káli valleys. My specimens seem to correspond well enough with Mr. Butler's figure and description, but the markings are not very constant.

Family NYMPHALIDÆ, Swainson.

98. SYMPHÆDRA NAIS, Forst. Haldwáni in the Tarai, 1,000 feet.

99. EUTHALIA DOUBLEDAII, Gray. Naini Tál, Ránibágh, etc., 2,000—7,000 feet. Found chiefly in the rains.

100. EUTHALIA APIADES, Mén., (*appiades*). Lower Gori, Jhulaghát on the Káli, 2—3,000 feet, scarce.

101. EUTHALIA GARUDA, Moore. Káli valley, 2—3,000 feet, scarce.

102. EUTHALIA LUBENTINA, Cram. Káli valley at Baghrihát, 2,500 feet, scarce.

103. Nymphalis (or Limenitis) danava, Moore. Gori valley at Garjia ghát, rare.

104. Moduza procris, Cram. Káli valley, 2—4,000 feet, scarce.

105. Potamis (or Apatura) namouna, Doub. Loharkhet, and Kápkot on the upper Sarju, 4—5,000 feet, scarce.

106. Athyma perius, Linn. (*leucothoë*). Kumaon generally, 1,000—6,000 feet. Unlike the other species of *Athyma* it prefers open meadows to forests.

107. Athyma selenophora, Koll. Kali and Gori valleys, 2—3,000 feet.

108. Athyma cama, Moore. Almora; Eastern Kumaon generally, 2—5,000 feet, common.

109. Athyma zeroca, Moore. Gori and Káli valleys, 2—3,000 feet, varies considerably in markings.

110. Athyma opalina, Koll. Upper Himalayan region, from Naini Tal, 6,000 feet, and Askot, 4,500 feet, up to Dwáli, nearly 10,000 feet.

111. Rahinda hordonia, Stoll. Ránibágh, the Tarai, and the Rámganga, Káli, and Gori valleys, common, 1—4,000 feet.

112. Neptis emodes, Moore. Common all over Kumaon from 2,000 to 7,000 feet.

113. Neptis varmona, Moore. Káli valley, Eastern Kumaon, also Haldwáni in the Tarai, 1—3,000 feet.

114. Neptis nandina, Moore. Loharkhet, N. W. Kumaon, 5,000 feet.

115. Neptis vikasi, Horsf. Sarju valley at Kápkot, 4,000 feet, rare.

116. Neptis soma, Moore. Common in the Sarju, Gori, and Káli valleys, 2—4,000 feet.

117. Neptis susruta, Moore. Káli valley, 2—3,000 feet.

118. Neptis mahendra, Moore. Common, extending from the Sarju and Káli valleys at 2,000 feet, up to over 9,000 feet near Dwáli, N. W. Kumaon, and at Budhi, N. E. Kumaon. My specimens differ from those in the Indian Museum in being darker red below with all the white markings smaller.

119. Neptis amba, Moore. Káli and Sarju valleys, 2—5,000 feet. Most of my specimens are much darker than the common *amba* of the N. W. Himalayas, and are by no means fixed in type, gradually changing to *cartica*, which is therefore in my opinion only a form of this species. The allied *carticoides*, however, seems distinct.

120. Neptis ananta, Moore. Rámganga valley, 2,500 feet, rare.

Suborder RHOPALOCERA HETEROPODA.

Family LYCÆNIDÆ, Stephens.

Subfamily Amblypodinæ.

121. Panchala ganesa, Moore. Naini Tál, Dhánkuri, 6—8,000 feet.

122. Panchala rama, Koll. Kumaon generally, 1,000—8,000 feet. Though it belongs to a tropical group, I found it flying in great numbers on the mountain near Rámgarh (7,500 feet) in December, when the ground was powdered with snow. The males and females of *rama* are very much alike. *Dodonæa*, which I have from Mari, seems to be a distinct species.

123. Iraota mæcenas, Fabr. One male, Jhulaghát, eastern border of Kumaon; an extremely variable species wherever I have found it.

I prefer to separate this group from the next by the structure of the prehensores, the clasps of *Deudorix* being very small and immoveably fixed on each side of the intromittent organ, which is not retractile; while in *Amblypodia* they are free and tolerably well developed. As for the egg, I had examined that of some twenty species of the *Amblypodia* group, including several of the genera, and found it always covered with acute spines. But in all the females of *rama* examined by me, there were two easily-distinguished forms of egg present in about equal numbers, the one with the spines acute as in *Amblypodia*, the other with them truncate as in *Deudorix*.

Subfamily Deudoriginæ.

124. Virachola isocrates, Fabr. Charma valley, Eastern Kumaon, 3,000 feet.

125. Deudorix epiarbas, Moore, (*epijarbas*). Kumaon generally, 2—6,000 feet.

126. Baspa melampus, Cram. Almora, Loharkhet, Káli valley, 2—6,000 feet.

127. Hysudra selira, Moore. Almora, Pyura, 4—6,000 feet.

128. Bidaspa nissa, Koll. Kumaon generally, 3—7,000 feet. My specimens rarely show any trace of the red spot above, and are of a richer metallic above and a deeper rufous below than Simla specimens. The genus seems very close to *Rapala*.

129. Rapala schistacea, Moore. Lower Rámganga and Sarju, 2—4,000 feet. Distinguished by the beautiful blue of the hindwings and the basal part of the forewings, when seen in certain lights, especially from behind.

130. Rapala grisea, Moore. Kápkot, Bágheswar, Kháti, 3—7,000 feet. This species, which has the transverse band below broader than in *schistacea*, and the wings dull steel-blue in all lights without the brilliant cyaneous reflections of that species, has been identified by Mr. de Nicéville as *orseis*, Hew. (from Sumatra), and so named by him in his lists of the butterflies of Sikkim, Calcutta, and the Andaman Islands.

An aberrant male and female from Jhulaghát on the western border of Nepál differ in the extreme width of the transverse band below, which is very dark, and on both wings of the male, and less perfectly in the hindwing of the female, is united with the dark discocellular band. I prefer not to separate this form from *grisea*, though it is perhaps distinct.

131. Curetis thetis, Drury, (*thetys*). Káli valley, not common. Except in the outline of the wings, which is that of the typical *thetis*, my Kumaon specimens do not differ from *bulis*. The red is confined to a rather small area of the forewing, indented from above, and not reaching the hind margin.

132. Curetis bulis, Doub. Sarju, Káli, and Gori valleys, 2—5,000 feet. Male as in the preceding form, the red of the forewing occupying most of the cell, but not extending above middle median on the disc, the hind margin widely black. Female with a large white medial area on the forewing indented at the end of the cell. Hindwing with a small lunular white patch on the disc, extending to the whitish costa. It thus seems to resemble *dentata*, Moore, in colouring, but the hindwing, like the forewing, is very strongly angled. My specimens vary remarkably in size. Though the prehensores are very complicated in this genus, I have not been able to detect the slightest difference between those of the two species (?) here called *bulis* and *thetis*.

133. Loxura atymnus, Cram. Ránibagh and the Tarai, 1,000 feet. Of the position of this as of the preceding genus, I am still uncertain.

Subfamily Theclinæ.

134. Cheritra acte, Moore. Askot, 5,000 feet, Baghrihát, 2,500 feet, E. Kumaon, scarce.

135. Cheritra jafra, Godt. Jhulaghát, Gori, and Káli valleys, 2—3,000 feet.

136. Spindasis lohita, Horsf., (*himalayanus*, Moore). Below Kápkot, 3,500 feet, scarce.

137. Spindasis vulcanus, Fabr. Haldwáni at the foot of the hills, 1,000 feet.

138. Tajuria longinus, Fabr. Haldwáni at foot of hills, 1,000 ft., one male.

139. PRATAPA DEVA, Moore. Kápkot, 4,000 feet, a female. It resembles a specimen from Sikkim in the Indian Museum, being much darker than those from Kánara and the plains of Bengal, the blue on the forewing covering only the lower half of the base of the cell, paler blue from the hind margin to just above the middle median, broken by black veins, the margin broad and black. Hindwing bluish as in *deva*, but powdered with gray scales, and interrupted by black veins, and by a submarginal line of joined dark lunules, the costal border widely dark. Owing to my ignorance of the male, I am unwilling to describe the species as new.

140. REMELANA YAJNA, n. sp. Allied to *megisbia*, Hewitson. Black, the upper part of the *hindwing* glittering azure from the first subcostal to the radial, extending beyond into the cell (slightly), and almost to the costal and the upper median veins, but not approaching the apex or the costa. Anal lobe gray, touched with fulvous and bluish, a slender marginal bluish line on the lower part of the hindwing, cilia dark. *Below* rufous-brown, darker at apex. On the *hindwing* a slender transverse line of fulvous crosses the wing, almost straight to the lower median, bordered outwardly with slender lines of black and white, continued by similar lines at right angles with it from the lower median to the abdominal margin. On the *forewing* the line is chiefly white (the fulvous and black being obsolescent), slender, and sinuous, extending from the submedian almost to the costa. A broken submarginal darker line obscurely visible on both wings. Lower part of hindwing with a large area of gray extending to the upper median, bordered outwardly with white and black lines, part of abdominal margin white. Anal black spot partly bordered with fulvous and silvery lilac, a submarginal black-centred fulvous spot between the lower medians. Tails black, tipped with white, the outer more slender than the inner, and somewhat shorter. Antennæ black annulated with white, club black. Expanse $1\frac{1}{3}$ inch.

Differs from *megisbia*, Hewitson, habitat unknown, in the ground colour of the underside, which is dull rufous-brown, that of Hewitson's species being orange (in his description) or orange-yellow (in his plate).

Two males, Garjiaghát and Baghrihát, on the Káli, 2,500—3,000 feet.

141. CHLIARIA KINA, Hewitson. Loharkhet, N. W. Kumaon, 5,000 feet. *Male, forewing* widely black over the apex, costa, and outer margin to the lower angle; a large whitish discal patch (greenish or bluish in different lights, just entering the cell and extending from the submedian to the upper median, and obscurely along the median basally and the submedian discally) set in the middle of an area of

bright blue, only visible in some lights, and extending to the hind margin and nearly to the costa. *Hindwing* bluish-gray over the outer disc from submedian to lower subcostal, and also on the abdominal margin basally, with three somewhat darker spots anally and subanally, of which that between the lower medians is rather distinct. Edge line black, fringe white, cell and the space between the subcostals blue in some lights as on the forewing. *Below*, whitish with a silky lustre, two dark transverse lines across end of cell of forewing, a dark discal transverse line in two parts, narrowed, and removed inwardly below the upper median. Two darker lines of joined lunules submarginally; edge line of both wings dark. *Hindwing*, a black spot near the costa basally, a double streak across end of cell, a dark transverse discal band broken into six pieces, that near the costa being nearly black, a submarginal line of streaks backed by a continuous irregular dark-gray line, a black spot surrounded with dark ochreous between the lower median branches, a smaller similar spot on the lobe.

Female, black, forewing with a whitish discal area most distinct between the median branches, but extending beyond, and entering the interno-median space as a pale band. Cilia white, especially at the lower angle. Disc of hindwing with a pale area cut by dark veins, a submarginal white line and an obscurely darker subanal spot near the margin. Both sexes have four tails, of which, unlike *othona*, the outer ones are much the shorter. My specimens agree with Sikkim males in Mr. de Nicéville's collection; the Sikkim female I have not seen. They are much darker than Mr. Hewitson's figures. My two males were both taken flying in a flock of the common *Cyaniris puspa*, from which I could not distinguish them till I caught them. If this is a case of mimicry, it is the first, I believe, yet observed in the *Lycænidæ*.

142. CHLIARIA OTHONA, Hew. Lower Gori, E. Kumaon, 2,500 feet, Kápkot, N. W. Kumaon, 4,000 feet. Male beautifully glossed with dark blue on the forewing beyond the cell, seen only in certain lights. Female, the pale blue of the male, replaced by a pale gray area from the hindmargin of the forewing to the middle median. Hindwing with a similar area (without any trace of blue) extending nearly to the margin, where there is a dark subanal spot with fainter ones near it. Marginal black and white edge-lines as in male. *Below* like the male, marks somewhat paler, subanal black spot bordered narrowly with pale ochre, wings wider and more rounded than in the male.

143. ILERDA ODA, Hew. Naini Tal, 6,000—7,000 feet.

144. ILERDA BRAHMA, Moore. Naini Tal, Lohárkhet, 5—7,000 feet.

145. ILERDA SENA, Koll. Kumaon generally, extending up to

Budhi in Byáns (9,000 feet), and down to 3,000 feet. It frequents drier and more open ground than the other species.

146. Ilerda tamu(?), Koll. Upper Sarju, Pindari, and Káli valleys, 5—9,000 feet, scarce.

147. Ilerda coruscans, Moore. Same localities. This species is shining greenish-blue well beyond the cell, and to the hind margin of the forewing, and over the disc of the hindwing. The preceding species is merely powdered with the same colour, which does not extend on the forewing beyond the cell or to the hind-margin, and is nearly obsolete on the hindwing. As in other *Ilerda*, these species are easily distinguished by their prehensores, the clasp of *coruscans*, seen from the side, being truncate and apparently unarmed, while in *tamu*(?) it is very broad and rounded at the end, with a line of strong, bent hooks. The uncus of *tamu* seen from the side is shorter than in *coruscans*, and its branches are more bent. I name the preceding species with great doubt, being unable to distinguish between *tamu*, *androcles*, *moorei*, and *langii*. It is so difficult to describe, and so impossible to figure the colouring of an *Ilerda*, that I think it will be very hard for the student to separate the four species mentioned, except by examination of the prehensores, which ought to be figured.

148. Ilerda epicles, Godt. Eastern Kumaon, in the Káli valley, 2—4,000 feet, at Askot (5,000 feet) and the Dhoaj Mountain (6,000 feet). This genus is very close to *Chrysophanus*, the prehensores being generically the same, though each species has its characteristic form.

149. Chrysophanus timæus, Cram. (*timeus*). Naini Tál, 6—7,000 feet, above Garbyan, and at Kálápáni, N. E. Kumaon, 11—15,000 feet. Comparing the prehensores of my specimens with those figured by Dr. White, I should suppose the species distinct from the European *phlæas* (*phlœax ?*).

150. Chrysophanus pavana, Kollar. Kumaon generally, 4,500—13,000, local.

151. Surendra quercetorum, Moore. Bágheswar, Lower Rámganga, Gori, and Káli valleys, 2—4,000 feet. The egg clearly shows that the genus is near *Thecla* and remote from *Amblypodia*.

152. Thecla (or Zephyrus) birupa, Moore. Outer Himalayas, Pyura and Rámgarh, 4,000—7,000 feet.

153. Thecla syla, Koll. Dhánkuri, 9—11,000 feet, N. W. Kumaon.

154. Thecla icana, Moore. Dhánkuri, 9—11,000 feet, N. W. Kumaon, also in Chaudáns in N. E. Kumaon.

155. Thecla mandara, n. sp. Allied to *icana*, but whereas that species is metallic over the disc of the hindwing and most of the

forewing, interrupted by black veins, and appears green in some lights and violet in others, this species is only touched with obscure violet close to the base of the forewing: the disc has a faint lustre, as if greasy. *Below* more rufous than *icana;* the transverse discal line extends to the lower median, slightly bent inwards at its lower end; the discal band of the hindwing is straight, the submarginal band rounded: both are tinged with reddish. A blurred, obsolescent ocellus of black and reddish anally and subanally. Outer margin of the forewing strongly convex, sinuous, outer margin of hindwing not scalloped, abdominal marginal not excavated, but straight or slightly convex. The prehensores, though generally resembling those of *icana*, are quite distinct. Both are distinguished from *syla* and *birupa* by the uncus seen from the side being divided horizontally. In *icana* the upper lobe is slender, bent downwards, and projects beyond the lower. In this species the upper lobe is straight, and shorter than the long and massive lower lobe. The clasp (which in both species tapers obliquely upwards) here ends in a blunt, almost vertical point, while in *icana* it ends in a sharp horizontal beak. The uncus in *birupa* and *syla* is very different, being broad and entire, when viewed from the side.

There is an allied species undescribed in the Indian Museum, collected by Mr. de Nicéville in the Jalauri Pass, N. W. Himálayas. It is distinctly violet above in all lights and has a silver-white line across the hindwing below.

Subfamily GERYDINÆ.

156. ALLOTINUS MULTISTRIGATUS, de Nicéville. Two females, Askot, 5,000 feet, E. Kumaon. I also found it common at Dimagiri and Barakhal in the Chittagong Hill Tracts, and on Sirtai Mountain in the Lushai country. I wrote a description of it last September, but on my return to Calcutta found that Mr. de Nicéville had anticipated me, giving it the name of *Gerydus multistrigatus.* It is not, however, a *Gerydus*, the tarsi being cylindrical, the first joint nearly twice as long as all the others combined. The egg is extremely flat, strongly bicarinate at the side, more than three times as wide as high, with the sculpturing all but obliterated above. The third subcostal branch is given off opposite the end of the cell, for which reason I put it in the genus *Allotinus.* Of the other Indian species of the *Gerydinæ*, *drumila* is very much like *multistrigatus;* it likewise has the legs cylindrical, but the third subcostal is emitted a little beyond the end of the cell. It has been found in Sikkim, Cachar, and the Lushai country. *Paragerydus horsfieldii*, and another allied species entirely black above, occur abundantly in Arakan and the Chittagong Hill Tracts, north of which they

have not yet been observed. The egg is not quite so flat as in *multistrigatus*, and there is no trace of carination: it is beautifully reticulate above. *Hamada*, Druce, described from Japan, is found in Sikkim, Cachar, and the Chittagong Hill Tracts; it is very unlike any other member of this group, if indeed it belongs to it at all. From the structure of the prehensores I should rather place it among the *Lycæninæ*. The legs are short and thick, the wings broad and rounded, the third subcostal originates before the end of the cell. I did not succeed in examining its egg. Another species of this subfamily I found abundantly in the Chittagong Hill Tracts. Sikkim specimens of it have been identified by Mr. Moore with *boisduvalii* from Java. It is the only true *Gerydus* yet known from India. All the *Gerydinæ* which I have examined are distinguished by the extraordinarily flattened egg, and by the curious structure of the prehensores, the clasps being very long, broad, thin and plate-like, somewhat resembling the "valves" of the *Papilionidæ*. It is my impression that the egg of *Catapœcilma* (*Catapœcilma*, Butler) *elegans*, Druce, is intermediate in character between those of the *Deudorix* and *Gerydus* groups.

Subfamily PORITINÆ.

157. PORITIA HEWITSONI, Moore. A male and a female, Káli valley at Garjiaghát.

Subfamily LYCÆNINÆ.

158. EVERES DIPORA, Moore. Everywhere from 1,000 to 10,000 feet. The red area on the hindwing below is variable. The female is dark brown above. The male is indistinguishable from *parrhasius*.

159. TARUCUS THEOPHRASTUS, Fabr. Haldwáni at the foot of the hills.

160. TARUCUS VENOSUS, Moore. Bágheswar, Sarju valley, common; also in the Káli valley, 2,000—4,000 feet.

161. ——— ? PLINIUS, Fabr. Jhulaghát, Káli valley, 2,000 feet. The structure of the costal and sub-costal veins of the forewing shows that this species does not belong to Mr. Moore's genus *Tarucus*. It is perhaps allied to the next group.

162. AZANUS UBALDUS, Cram. Ránibágh and Haldwáni at the foot of the hills, Jhulaghát in the Káli valley, 2,000 feet.

163. AZANUS GAMRA, Lederer, (*crameri*, Moore). Haldwáni, scarce.

164. POLYOMMATUS BÆTICUS, Linn. Kumaon generally, up to Budhi, 9,000 feet.

165. LAMPIDES ÆLIANUS, Fabr. Ránibágh, at the foot of the hills; Sarju and Káli valleys, 2—4,000 feet, scarce.

166. CHILADES LAIUS, Cramer, (*varunana*, Moore). Haldwáni at the foot of the hills.

167. CHILADES PUTLI, Koll. Everywhere up to 7,000 feet.

168. CASTALIUS ROSIMON, Fabr. Jhulaghát, 2,000 feet.

169. CATOCHRYSOPS STRABO, Fabr. Lower Gori valley, also at Ránibágh, 1—3,000 feet.

170. CATOCHRYSOPS CNEIUS, Fabr. (*cnejus*). Kumaon generally up to 10,000 feet (Dhánkuri).

171. CATOCHRYSOPS PANDAVA, Horsf. Ránibágh, Sarju valley, 1—4,000 feet.

172. NACADUBA DANA, de Nicéville. Kumaon and the plains, up to 5,000 feet, not so common as *ardates*. It is quite different from the tailless *ardates* of Orissa, the hindwing being broad and truncate.

173. NACADUBA CŒLESTIS, de Nicéville. One male, Jhulaghát, 2,000 feet.

174. NACADUBA ARDATES, Moore. Kumaon generally up to 5,000 feet, common. The tailless form, which in Orissa and the Eastern and Western Gháts is almost as common as the tailed, apparently does not occur in Kumaon.

An aberrant male, Ránibágh. The transverse discal band of the underside is extremely broad on both wings, united with the discocellular streak. This aberration occurs in many *Lycœnidœ*. I have a remarkable example of it in a specimen of *Nacaduba prominens* from Bassein, Burma, and in one or two specimens of *Zizera maha* and *Z. sangra*, in which the discal spots are all very elongate below. Similar though much rarer variations occurs in the *Argynnis* and *Cynthia* groups of the *Apaturidæ*, of which I have an example in an *Atella*. One or two species have been based on these curious monstrosities.

175. ZIZERA PYGMÆA, Snellen. Ránibágh, 1,000 feet.

176. ZIZERA SANGRA, Moore. Ránibágh, Jhulaghát, 1,000—2,000 feet.

177. ZIZERA MAHA, Koll. Kumaon generally from the plains up to 9,000 feet.

178. ZIZERA KARSANDRA, Moore. Ránibágh, Bágheswar, 1,000—4,000 feet.

179. LYCÆNA ARIANA. Moore. Naini Tál, 4,000—8,000 feet.

180. LYCÆNA ASTRARCHE, Bgstr. (*nazira*, Moore). Naini Tál, Dhánkuri, 6,000—10,000 feet.

181. CYANIRIS CŒLESTINA, Koll. Naini Tál, Jágheswar, 6—8,000 feet.

182. CYANIRIS HUEGELII, Moore. All Kumaon as low as Bágheswar 3,500 feet, as high as Garbyán, 12,000 feet.

183. Cyaniris dilectus, Moore. Kháti, N. W. Kumaon, 7,000 feet, Toli and Garjiaghát, East Kumaon, 2—3,000 feet scarce. My specimens are very small.

184. Cyaniris albocæruleus, Moore. Kháti, N. W. Kumaon, 7,000 feet, rare.

185. Cyaniris vardhana, Moore. Jágheswar, 7,500 feet, rare.

186. Cyaniris marginata, de Nicéville. Dhánkuri, Kháti, 7—10,000 feet. *Female.* Both wings chiefly black, *forewing* with the white area larger and clearer than in the male, extending from the lower median to the lower radial, and into the end of the cell, where it is indented from above. Extreme base of forewing from cell to hind margin dull greenish-blue. Hindwing with a subapical white patch over three spaces, a black spot between the upper median and the radial, sometimes a streak across the end of the cell, a line of obscure whitish submarginal lunules. Part of the disc between the white area and the abdominal margin dull bluish. Below like the male.

187. Cyaniris puspa, Horsf. Kumaon generally, up to 7,000 feet, down to 2,000 feet. All these species except the first two, are easily distinguished both by their colouring and marking and by the shape of their prehensores.

188. Pithecops zalmora, Butler. Jhulaghát, Káli valley, 2,000 feet.

189. Pathalia malaya, Horsf. (*albidisca*, Moore). Ránibágh, Bágheswar, Kápkot, Jhulaghát, Dhárchula, 1,000—5,000 feet. All my Kumaon specimens, as well as those taken by me in Burma and Chittagong, are tailed, while in Orissa, Ceylon, and the Eastern and Western Gháts, their place seems to be taken by a tailless form. Of this last, those from Ceylon and the Western Gháts are apparently *Megisba thwaitesii*, but those from Orissa and the Eastern Gháts seem to me identical with *malaya* except in the absence of the tail. The occurrence likewise of the tailless form of *Nacaduba ardates* in those districts is worthy of remark.

Family ERYCINIDÆ, Swainson.

Subfamily Nemeobinæ, Bates.

190. Dodona durga, Koll. Kumaon generally, 2,500 to 8,000 feet.

191. Dodona eugenes, Bates. Naini Tál, 6—7,000 feet, Loharkhet, 5,000 feet, not common.

192. Abisara suffusa, Moore. Ránibágh 1,000 feet; also at Askot and in the Káli valley, 2,000—5,000 feet.

193. Abisara fylla, Hew. Askot, the Dhoaj, Eastern Kumaon, 4—7,000 feet.

194. Zemeros phlegyas, Cram. (*flegyas*). Askot and the lower Káli, Eastern Kumaon, 2—5,000 feet.

Family LIBYTHEIDÆ, Westwood.

195. Libythea myrrha, Godt. Kumaon generally from the Tarai up to 4,000 feet.

196. Libythea lepita, Moore. Almora, Naini Tál, Kháti, Chandáns, 5—8,000 feet. The prehensores are quite different from those of *myrrha*, from which species it seems perfectly distinct.

Suborder RHOPALOCERA HEXAPODA, Constant Bar.

Family PIERIDÆ, Duponchel.

197. Terias venata, Moore. Bágheswar, Askot, 3—5,000 feet. Felder describes a form of this species under the name of *santana* from Káladungi at the foot of the Kumaon Himalayas.

198. Terias drona, Horsf. Bágheswar, Almora, Naini Tál, 3—6,000 feet.

199. Terias hecabe, Linn. Everywhere up to 8,000 feet, occasionally higher. Many varieties, but none seem even locally constant.

200. Terias læta, Boisd. Eastern Kumaon, Askot, Gori, and Káli valleys up to Dhárchula, 2—5,000 feet.

201. Ganoris (or Mancipium) canidia, Sparrm. Hills generally, 2,000—11,000 feet, from the Káli valley at Jhulaghát up to Garbyán in Byáns.

202. Ganoris ajaka, Moore. Naini Tál, Dhánkuri, Kháti, Dwáli, 6,000—11,000 feet.

203. Aporia soracte, Moore, (*soracta*). Pindari valley, 9,000 feet, scarce.

204. Synchloe callidice, Esp. Two males, Pindari Glacier, 12,000 feet.

205. Belenois mesentina, Cram. Ránibágh, 1,000 feet.

206. Huphina nerissa, Fabr. Haldwáni at the foot of the hills.

207. Delias eucharis, Drury. Almora, Ránibágh, 1—5,000 feet.

208. Delias belladonna, Fabr. Sarju, Káli, and Gori valleys, 2—5,000 feet. If Mr. Butler's distinctions are to be followed, my specimens belong to *horsfieldii*, Gray, described from Nepál.

209. Nepheronia gæa, Felder. Naini Tál, Bhim Tál, 2—6,000 feet.

210. Catopsilia catilla, Cram. Bágheswar, Tákula, Káli valley, 1—6,000 feet.

211. Catopsilia crocale, Cram. Bágheswar, Ránibágh, 1—4,000 feet.

212. Catopsilia pyranthe, Linn. Bágheswar, Káli valley up to Dhárchula, 2—4,000 feet.

213. CATOPSILIA GNOMA, Fabr. Haldwáni at the foot of the hills.

214. GONEPTERYX ZANEKA, Moore. Naini Tál, Lohughát, 6—8,000 feet.

215. GONEPTERYX RHAMNI, Linn. (*nepalensis*, Doub.) Kumaon generally, 3,000—8,000 feet. The Kumaon form does not seem to me distinct from the European. I did not find *carnipennis*, a species recently described by Mr. Butler from the Káli valley.

216. COLIAS FIELDII, Mén. Kumaon generally above 6,000 feet. One taken at Garjiaghát on the Gori, 2,500 feet, others as high as 16,500 feet, near Tárá, on the Chinese border.

217. COLIAS HYALE, Linn. Lohughát in Káli Kumaon, 7,000 feet.

218. IXIAS PIRENE, Linn. (*pyrene*). Káli valley, 2—3,000 feet.

219. IXIAS MARIANNE, Cram. Haldwáni at the foot of the hills.

Family PAPILIONIDÆ, Leach.

Subfamily PARNASSINÆ.

220. PARNASSIUS JACQUEMONTII, Boisd. Pála, Jhidikhár, and TágIakhár, Chinese Tibet, 13,000—16,000 feet.

221. PARNASSIUS HARDWICKII, Gray. Bireg Mountain and the Pindari valley, N. W. Kumaon, Byáns valley N. E. Kumaon, 10,000—15,000 feet.

Subfamily PAPILIONINÆ, Swainson.

222. PAPILIO MACHAON, Linn. (variety *asiaticus*, Mén.). Common from 2,000 feet in the Sarju and Káli valleys up to 14,000 feet in Byáns and 12,500 feet in the Pindari valley.

223. PAPILIO (DALCHINA) CLOANTHUS, West. Kháti, Loharkhet, Lower Rámganga, 2—7,000 feet.

224. PAPILIO (DALCHINA) SARPEDON, Linn. Sarju, Rámganga, Gori, and Káli valleys 2—5,000 feet.

225. PAPILIO (ZETIDES) AXION ?, Felder. One battered male, Askot, E. Kumaon, 5,000 feet.

226. PAPILIO (ZETIDES) AGAMEMNON, Linn. Lower Gori, 2,500 feet, scarce.

227. PAPILIO (SARBARIA) POLYCTOR, Boisd. Almora, Sarju, and Rámganga valleys, 2—5,000 feet.

228. PAPILIO (ACHILLIDES) PARIS, Linn. Káli valley, 2—3,000 feet. The metallic area on the hindwing of all my specimens is blue rather than green.

229. PAPILIO (BYASA) PHILOXENUS, Gray. Pindari valley, 7,000 feet, scarce.

230. PAPILIO (MENELAIDES) ARISTOLOCHIÆ, Fabr. Ránibágh and Haldwáni at the foot of the hills.

231. PAPILIO (ORPHEIDES) ERITHONIUS, Cram. Ránibagh, Bágheswar, 1—4,000 feet; generally replaced by *machaon* except in the Bhábar and the outer hills.

232. PAPILIO (SAINIA) PROTENOR, Cram. Kumaon generally, 2—6,000 feet, though never very common.

233. PAPILIO (LAERTIAS) POLITES, Linn. (*polytes*, or *pammon*). Kumaon generally, 1,000—6,000 feet, common.

234. PAPILIO (CHILASA) DISSIMILIS, Linn. Káli valley at Jhulaghat and Baghrihát, 2—3,000 feet, scarce.

235. PAPILIO (CHILASA) PANOPE, Linn. Káli valley at Jhulaghát, 2,000 feet, scarce.

236. PAPILIO (CHARUS) HELENUS, Linn. Káli valley, Dwálisera, 2,000 feet, scarce.

Family HESPERIADÆ, Leach.

Subfamily HESPERINÆ.

237. HESPERIA (or PYRGUS) GALBA, Fab. Bágheswar, Balwakot, Dhárchula, 2—4,000 feet.

238. HESPERIA KASHMIRENSIS, Moore. One male, Garbyán, N. E. Kumaon, 12,000 feet.

Subfamily SUASTINÆ.

239. BADAMIA EXCLAMATIONIS, Fabr. Near Bhim Tál, Outer Range, 3,000 feet.

240. CHOASPES BENJAMINI, Guér. Lower Sarju valley, 2,000 feet. I am not sure of the position of this genus and the preceding one.

241. SUASTUS TOONA, Moore. Lower Gori, 2,500 feet.

242. SUASTUS ELTOLA, Hew. Gori, Káli, and Sarju valleys, 2—5,000 feet, common and variable.

243. SUASTUS GREMIUS, Fabr. Askot, E. Kumaon, 5,000 feet.

244. HYAROTIS ADRASTUS, Cram. Lower Gori, 2,500 feet, Tákula, 5,000 feet, scarce.

245. TAGIADES ATTICUS, Fabr. (*menaka*, Moore). Sarju, Káli, Gori valleys, 2—4,000 feet.

246. SARANGESA PURENDRA, Moore. Naini Tál, 4,000 feet, Almora, 5,000 feet.

247. SARANGESA DASAHARA, Moore, Gori and Káli valleys, 2—4,000 feet.

248. SATARUPA SAMBARA, Moore. Bágheswar, Tákula, Lower Gori, 2—5,000 feet.

249. ABARATHA SARAYA, n. sp. One male, Bágheswar on the Sarju (the Sarayu or Saraya of the Sanskrit poets), 3,500 feet.

Agrees with Mr. Moore's description of the genus *Abaratha* except that the apex of the forewing is not acute but right-angled, that of the hindwing decidedly rounded. The outer margin of the hindwing is also more scalloped, and less irregularly angulate. *Above*, fuscous with the following tawny-ochreous marks: a line of streaks just within the margin; a line of square spots from the costa to the upper median branch, continued to the hind margin by a series of larger and more irregular blurs, removed further from the outer margin; a dull area just beyond the cell, from costa to the middle median; three large irregular spots occupying the middle of the cell, and the two spaces below between the submedian and the middle median. Also the following translucent spots; five apical ones, the upper three elongate and approximate; one at the end of the cell, almost bifid, with a dot on the costa above it; four on the disc from the submedian to the upper median, the second from above largest of all and adjoining that at the end of the cell. Also one in the cell near the base. All these are surrounded by blackish rings above and below. A blackish marginal line; cilia long, alternately black and whitish. *Hindwing* rusty ochreous, with a marginal dark line, and a discal, a cellular and a sub-marginal row of dusky spots, but no translucent ones. *Below* paler ochreous, without any rufous tinge, the translucent spots set in small blackish patches, a submarginal line of joined dusky spots, and a dark streak near the base from the submedian to the median veins. *Hindwing* with a black transverse streak at the end of the cell, a fainter one nearer the base of the cell, and a circle of large and conspicuous black spots, nine in all, round the disc, whereof two are between the costal and the subcostal, and two between the median and the submedian veins; whitish hairs at the extreme base. Body dull ferruginous above, whitish below. Female unknown.

Differs from *ransonnetii*, Felder, its nearest ally, in the absence of all white on the disc below. In colouring it is somewhat intermediate between *ransonnetii* and the curious *Abaratha agama* of Sikkim, which seems to mimic *Argynnis issæa.*

250. ANTIGONUS ANGULATUS, Feld. Lower Sarju valley, 2—3,000 feet.

251. HALPE SEPARATA, Moore. Kháti and Dwáli, Pindari valley, 7—9,000 feet. The female differs from the male in the larger size and squarer shape of the apical and cellular translucent spots. In the male the outer discal spot is sometimes wanting.

252. ISOTEINON MASURIENSIS, Moore. Lohárkhet, N. W. Kumaon, 7,000 feet.

253. ISOTEINON SATWA, de Nicéville. Jhulagh´at, Káli valley, rare.

254. COLADENIA DAN, Fab. (*fatih*, Koll.). Gori and Káli valleys, 2—5,000 feet.

255. COLADENIA DHANADA, Moore. Káli valley 2—5,000 feet. I am neither sure that these two species belong to the same genus, nor that either of them (or the two species of *Isoteinon* above named) should be placed in this subfamily, which includes many of the larger Indian *Hesperiadæ*, and especially those of the *Ismene* group.

Subfamily BAORINÆ.

Cyclopides Group.

256. CYCLOPIDES SUBVITTATUS, Moore. Sarju valley 3—6,000 feet, Kali 2,500 feet.

257. ? PLESIONEURA SUMITRA, Moore. Pindari valley, 7—9,000 feet, Chaudáns, 7,000 feet.

258. ? PLESIONEURA PULOMAYA, Moore. Pindari valley, 7—9,000 feet. I have taken specimens transitional between this species and the last, and think it probable that the two are not specifically distinct.

259. ? PLESIONEURA LEUCOCERA, Koll. Sarju and Káli valleys, 2—5,000 feet. Some of my specimens seem somewhat transitional to *munda*, Moore, from the North West Himalayas, the spots of the hindwing being evanescent. My females have the antennæ entirely dark.

Baoris Group. (*Astyci*, Huebner, apud Scudder.)

260. PLESIONEURA CURVIFASCIA, Felder, (*alysos*, Moore). Bágheswar, 3,500 feet.

261. UDASPES FOLUS, Cram. Sarju and Káli valleys, 2—4,000 feet.

262. PARNARA ASSAMENSIS, Wood-Mason and de Nicéville. Gori and Káli valleys, 2—4,000 feet.

263. PARNARA BADA, Moore. Bágheswar, 3,500 feet.

264. CHAPRA KARSANA, Moore. Lohárkhet, 5,000 feet.

265. CHAPRA MATHIAS, Moore. River-valleys 2,000—4,000 feet.

266. CHAPRA PROMINENS, Moore. Lower Rámganga, 2,500 feet.

267. THANAOS STIGMATA, Moore. Bágheswar, Balwakot, 2—4,000 feet. Varies considerably.

268. TARACTROCERA SAGARA, Moore. Bágheswar, Dhárchula, common, 2—4,000 feet.

269. TELICOTA BAMBUSÆ, Moore. Káli and Gori valleys, 2—4,000 feet.

270. PADRAONA DARA, Moore. River valleys, 1—4,000 feet, common.

271. PADRAONA MÆSOIDES, Butler. Ditto. Differs from the preceding chiefly in the rich, dark tawny-ochreous colour of the underside, *dara*-

being greenish-yellow set with dark scales. The markings are almost exactly alike. The prehensores are singularly different: Seen from above, the uncus of *dara* is gradually acuminate, that of *mœsoïdes* abruptly truncate and slightly bilobed; seen from the side the uncus of *dara* is slender, tapering and pointed at the tip, that of *mœsoïdes*, which is surmounted by a prominent tuft of hairs, is blunt and rounded at the tip; the clasp of *dara* is much more slender than in *mœsoïdes*, and its terminal hook much more produced and bent.

The prehensores of the *Hesperiadæ* are by no means so constant as those of other butterflies, and are lacking in *generic* characteristics. Nevertheless, their study seems to me absolutely necessary to any clear understanding of the species.

VI.—*On a second Species of Uredine affecting* Abies smithiana, *Forbes.*

By SURGEON A. BARCLAY, M. B., *Bengal Medical Service.*

[Received Jan. 8th;—Read Feb. 3rd, 1886.]

(With Plates IV. & V.)

The Himalayan spruce-fir (*Abies smithiana*, Forbes) harbours yet another uredine. This tree, as I have already mentioned in a former paper,* is not common in Simla, though very common at slightly higher elevations a few miles beyond the station. A few, however, do occur in the station, and on three of them this second species of uredine was found. Two of these grow in the garden of a house towards the western side of the station, and were most probably planted there for ornamental purposes, whilst the third grows in an open, though preserved, forest on "Jakko," a peak towards its eastern end about two miles as the crow flies from the first mentioned locality. I noticed the parasite for the first time early in July when it was in all cases fully mature.

The abnormal appearances caused by the growth of this fungus differ very widely from those already described as characteristic of infection by the first described species. The whole tree is generally besprinkled with the fungus, and it is then conspicuous by the amount of yellow discoloration occasioned. In this affection also the youngest shoots only are attacked, not one of the needles of the preceding year's growth being involved. A marked difference, however, in the behaviour of this parasite, as compared with the first species described, lies in this that not every needle of an attacked shoot is involved. Indeed, only a few needles may be affected, although frequently the greater number are (fig. 1). Nevertheless, some intermediate needles always remain free. Again, no marked hypertrophy of the tissues is caused by this parasite, and the affected needles are not curved. Each affected needle usually bears several æcidia, the number varying from four to thirteen or even more. A large zone of yellow discoloration surrounds each æcidium. If only a few æcidia are borne, and these at some distance from one another, a corresponding number of yellow rings encircles the needle; but when the æcidia are numerous, the whole needle may be uniformly discoloured with the exception of about a quarter of an inch of its extremity. Whilst the peridia are still unopened, the æcidia appear usually as long linear yellowish swellings with their long axes coincident with the length of the needles; but they are sometimes short and spherical. They occasionally attain a length of 2·5 m.m., rarely more, and when ripe open by irregular frayed rents on their summits. The peridium is then seen to be white. The æcidia are usually borne on the upper surfaces of the needles, though frequently also on their sides, but never on their lower surfaces. The spermagonia, which may be recognised as minute dark spots, are irregularly scattered all over the needle.

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* *Supra*, p. 1.

Microscopical Characters.—In a transverse section of a needle through an æcidium but little derangement of the normal tissue elements will be observed. Thus, the resin canals are not obliterated, and the general arrangement of the palisade-like parenchyma-cells is maintained everywhere, except where replaced by the æcidial fructification. The central wood-bundle is not disturbed. The æcidia are buried deeply in the parenchymatous tissue with generally only one layer of these cells between their bases and the endodermal sheath surrounding the central bundle (fig. 7). As the æcidial fructification ripens, the hypodermal layer of cells together with the overlying epidermal layer is first lifted and then rent. Ripe æcidia in such transverse sections measure about 0·294 m.m. in breadth and 0·259 m.m. in depth. They are covered by a peridium of a single layer of long flat cells each measuring on an average 36 to 60 μ in length by 20 μ in breadth (figs. 5. and 7). At the basis of æcidia and spermagonia mycelial filaments are aggregated in masses, but elsewhere they are sparingly present. At such places the masses of filaments dissociate the parenchyma-cells. The mycelium nowhere penetrates the cells, and, consequently, there are no haustoria. The hyphæ vary in diameter from 4 to 5 μ in diameter. They contain a few minute globules of orange-yellow oil (fig. 2). Filaments may be seen coursing through the whole of the tissue underlying the discoloured parts of needles, excepting the central bundles, which are efficiently protected by the endodermal sheaths. Their structure may be most conveniently observed in the air-cavities below stomata, where they may generally be seen (fig. 6). The hymenium is flat, and the æcidiospores are given off in single rows from short sterigmata. Each spore of a series is separated from adjoining ones by an intercalary cell or lamella. These intercalary cells are best seen between the upper spores of a series, being there larger and rounder, whilst between the lower spores they are thin and wedge-shaped (fig. 3).

The æcidiospores are for the most part oval, measuring on an average 30 × 24 μ, but varying from 24 × 24 μ to 34 × 22 μ. The epispore is covered with prominent deciduous spines, which sometimes become detached in flakes. The whole thickness of the epispore is about 2 to 3 μ. They contain orange yellow granular contents sometimes with large oil globules (fig. 4). The spores were on several occasions placed in water in a moist cell with a view to observing their mode of germination, but they persistently refused to grow. I had no opportunity of discovering whether they would germinate after a period of quiescence; probably such a period is necessary for them before germination is possible.

The spermagonia are likewise deeply set with their bases below the hypodermal layer of cells (fig. 8): they have no hairs on their summits and measure about 0·353 m.m. in width by 0·287 m.m. in depth.

I looked carefully and often on all the surrounding vegetation for indications of a further cycle of development of this uredine, but could find no uredo- or teleutospore formation which I thought could possibly be related to it. It has evidently no relationship with the uredine occurring on the same host described in my former paper, for in the forests in which that species was found in great abundance this one never occurred. Although the individual shoots attacked by the former parasite are far more seriously injured, the entire shoot being killed by it, yet as regards the whole tree the fungus just described must be the more harmful owing to the much larger number of needles attacked which fall early leaving the tree in a very ragged condition.

EXPLANATION OF THE PLATES.

PLATE IV.

Fig. 1. General appearance of an affected shoot showing that only the needles of the last season's growth have been attacked and that many needles among those attacked have escaped entirely. About natural size.

" 2. Fragments of mycelial filaments, × 340.

Fig. 3. Row of æcidiospores towards the base of a series: showing intercalary cells or lamellæ most distinctly between the upper spores, × 340.

" 4. Mature æcidiospore, × 340.

" 5. Peridial cells, × 340.

" 6. Showing a few mycelial filaments in an air-cavity below a stoma, × 349.

PLATE V (Photographs).

Fig. 7. Transverse section of a needle through an æcidium shewing the depth to which its base extends, and a fragment of the pseudoperidium outside.

" 8. Longitudinal section of a needle showing a spermagonium above and the margin of an æcidium below.

VII.—*Notes on Indian* Rhynchota. No. 6.—*Addenda and Index.*

By E. T. ATKINSON, B. A., PRESIDENT OF THE SOCIETY.

[Read November 4th, 1885.]

Genus PŒCILOPSALTRIA, Stål.

J. A. S. B. liii, (2), p. 211.

Basal cell of tegmina irregularly four or somewhat five-angled, very often broad; ulnar veins altogether distant at the base: head broad, obtuse, with the eyes broader than the scutellum; vertex more than twice broader than the eyes; ocelli twice and often thrice more distant from the eyes than from each other; frons slightly or moderately convex, at the base before the vertex scarcely or but a little prominent: thorax angulated on both sides: first femora without distinct spines; metasternum elevated, the elevated part furrowed, and somewhat sinuately truncated (*Stål*, Hem. Afr. iv, p. 2).

1. PŒCILOPSALTRIA AFFINIS, Fabricius.

J. A. S. B. liii, (2), p. 211, no. 2.

Body of a moderate size, spotted black: margin of thorax dilated: tegmina obscurely greyish, posterior margin broadly hyaline with several fuscous spots: wings much shorter, fulvous, black before the margin, striated fulvous, margin itself not hyaline but fulvous (*Fabr.*).

♂ ♀. Pale olivaceous-flavescent or virescent: lores (margin excepted), clypeus (ridge excepted), two small apical spots on, and two transverse lines towards, the base of the frons, a band on the genæ, a spot including the ocelli, two spots at the eyes and a transverse line (sometimes obliterated) on the vertex, a broadish lateral intramarginal line on the thorax, four basal spots (the median pair somewhat large), a narrow oblique lateral line (posteriorly abbreviated), and three small posterior spots on the scutellum, basal limbus of the dorsal segments of the abdomen and a lateral spot on the four last ventral segments, black. Tegmina opaque whitish yellow, clouded fuscous, a median spot in the radial area and a spot occupying the middle of the 1-2 paler ulnar areas, the apical areas (the entire eighth area and basal and apical parts of the first area excepted) vitreous, colourless; ulnar veins marked at the apex and near the apex on both sides with a small fuscous spot: wings lutescent; a narrow streak and the apical part, outwards broadly, and inwards narrowly, obscurely fuscous; this apical part at the veins and the veinless limbus and anal area, weakly lutescent. Head obtuse, frons slightly convex: lateral apical part of the vertex lying between the frons and the eyes subequal in breadth to the subbasal part of the frons; clypeus sinuately truncated at the apex: ocelli more than twice as distant from each other as from the eyes: sides of thorax much angularly dilated, angles somewhat straight, rounded at the extreme apex: sides of the interior ulnar area somewhat parallel behind the middle: metasternum elevated, longitudinally impressed in the middle, sinuated anteriorly: the veinless limbus of both tegmina and wings of equal breadth (*Stål*).

Genus PLATYPLEURA, Amyot & Serville, Stål.

J. A. S. B. liii, (2), p. 211.

Body stout, large: head not or scarcely broader than the scutellum, rarely narrower: ocelli rarely a little more than twice as distant from the eyes as from each other: the sides of the thorax much flattened out, foliaceous, horizontal, anterior angles turning towards the middle of the eyes, anterior margin sinuated behind the eyes; posterior limbus broad: basal cell of tegmina broad; ulnar veins emitted from it, distant at the base, interior ulnar area gradually broader towards the apex: entire tympana or the greater part concealed; opercula moderate, transverse, rounded at the apex, slightly valvate (*Stål*).

2. PLATYPLEURA CILIARIS, Linnæus.

Cicada ciliaris, Linn., Syst. Nat. (10th ed.) i, p. 436 (1758); Mus. Lud. Ulr. p. 155 (1764); Olivier, Enc. Méth. v, p. 757 (1790); Germar in Thon's Arch. ii, (2), p. 2 (1830); Silb., Rev. Ent. ii, p. 78 (1834): Stoll, Cig., p. 102, t. 26, f. 147 (1788).

Cicada ocellata, De Géer, Mem. iii, p. 220, t. 33, f. 2-3 (1773): Olivier, Enc. Méth. v, p. 751. t. 112, f. 3 (1790): Cape.

Tettigonia marmorata, Fabr., Syst. Rhyng. p. 38 (1803), Amboina.

Cicada marmorata, Germar, Thon's Archiv. ii (2), p. 17 (1830); Silb., Rev. Ent. ii, p. 79 (1834): *Platypleuraid:* Sign., B. S. E. F. (6 sér.) i, p. xlii (1881), China.

Oxypleura (?) marmorata, Walker, l. c. p. 24 (1850).

Platypleura ciliaris Stål, Hem. Fabr. ii, p. 3 (1869); Ofvers. K. V-A. Förh. p. 500 (1862); id. p. 707 (1870): Butler, Cist. Ent. i, p. 185 (1874).

Stål (in Hem. Afric. iv, p. 16, 1866) makes *P. ocellata*, De Géer of Walker, (excl. syn.) and *P. capensis*, Am. & Serv., one with *P. hirtipennis*, Germar, and also *Cicada plumosa*, Germar, a variety of the same species; again (in Ofvers. K. V.-A. Förh., p. 500, 1862) he unites *Cicada ocellata*, De Géer, *Cicada varia*, Olivier, from the Cape, and *Platypleura arcuata*, Walker (Ins. Saund. p. 1), from Ceram, with *P. ciliaris*, Linn., but Butler (l. c.) keeps the last two separate. Olivier is the only one that gives India as the locality; and I include the species in our Indian list as it is also recorded from Java and the Philippines, the fauna of which have a marked affinity with that of India.

Thorax with a rim: tegmina pale with white patches: wings blackish ferruginous, with a yellowish band bent back towards the disc and sometimes triple: abdomen blackish with pale and ciliated rings *(Olivier)*. Head and thorax green, spotted black: tegmina fuscous and variegated cinereous, with two whitish spots before the costa, which is virescent at the base: wings dull black with two small lines at the base, and a spot towards the margin, rufous; body cinereous (*Fabr.*).

3. PLATYPLEURA SPHINX, Walker.

J. A. S. B. liii, (2), p. 213, no. 6.

♂ ♀. Body pale tawny, tinged with white, briefly whitish pilose: vertex with two brown bands: rostrum tawny, tip brown reaching the hind coxæ: antennæ dark tawny: mesonotum with four obconical dark brown marks, outer pair long, inner pair short and pointing to two dots of the same colour: legs pale tawny; tips of the tibiæ darker; claws piceous, tawny at the base; first femora with tawny teeth which hardly rise above the surface; hind tibiæ with tawny spines which are piceous at the tips: tegmina whitish, brownish tawny towards the base and having elsewhere some irregular pale brown marks which, here and there, include white spots; veins yellow: wings brown, mostly yellowish white towards the base and having a large spot of the same colour in the disc, white at the tips with a white spot on the hind border which elsewhere is brown; flaps yellowish-white, with broad brown borders.

4. PLATYPLEURA CÆLEBS, Stål.

J. A. S. B. liii, (2), p. 213, no. 7.

♂. Sericeous, above testaceous; beneath with feet greyish: head above and wings sordid flavescent, middle of the vertex and apical lateral band, frons (basal spot excepted), two minute spots behind the middle of the thorax, two median basal spots on the scutellum, an oblong discoidal spot, and another very large, oblong-obtriangular, lateral spot on both sides, extended from the base beyond the middle, also the dorsum of the abdomen, black: venter fuscous: tegmina clouded pale fuscous and greyish-sericeous from the base beyond the middle, vitreous towards the apex; anastomoses and the apical and subapical spots on the longitudinal veins, fuscous: wings very slightly infuscate towards the apex, limbus sordid whitish, very slightly infuscate in the middle. Allied to *P. subrufa*, Walker, in stature, breadth of apical limbus of the tegmina and wings, and the form of the thorax, but the frons is more obtuse, much less prominent and the coloration and marking very distinct. Vertex more than twice as broad as the transverse eye; ocelli almost thrice as distant from each other as from the eyes: frons occupying a little more than one-third of the face: thorax gradually dilated from the base to a distance beyond the middle, thence rounded and abruptly narrowed: costa moderately dilated, subcostal vein and costa contiguous throughout their entire length: seventh apical area of the tegmina shorter than the eighth: apical limbus of tegmina and wings of equal breadth, that of the tegmina colourless: opercula somewhat longer than their greatest breadth, yellow-greyish, infuscate at the base (*Stål*).

5. PLATYPLEURA ANDAMANA, Distant.

J. A. S. B. liii, (2), p. 214, no. 8.

♀. Tawny pubescent: face moderately convex, transversely furrowed, with a deep central longitudinal furrow; luteous with two short black basal lines on each side of the vertex: a narrow black fascia, extending from eye to eye immediately in front of the ocelli: eyes brilliant, castaneous, broadly pilose behind: pronotum deeply furrowed with frontal edge and two small foveæ, placed close together near the middle of the hind border, piceous: mesonotum with two large obconical spots extending backwards from the fore border midway between which there is a discal dart-shaped mark and two dots wide apart near the hind border, black: there are also two other somewhat obscure black marks situate on the fore border on the outer sides of the large obconical spots: metathoracic cross with its fore borders piceous: abdomen above with the segmental sutures black, clothed with a luteous pubescence; anal appendage piceous, castaneous. Underside with legs ochraceous: rostrum extending to the second abdominal segment; its tip, two spots on the sixth abdominal segment, knees, and tarsi piceous: tegmina dark brown with pale semi-opaque markings, especially on the apical half. Basal third thickly covered with pale pubescence and containing five dark-brown spots, of which the most prominent are two which are subcostal, situate beyond the middle of this space, and a third one below the basal of those two spots. Remainder of tegmina less pubescent with a number of whitish spots, of which the most prominent are a transverse row stretching across from near the costa to the inner border, immediately beyond the basal third pubescent space; another more waved row beyond the middle, confluent near the costa, where they are very visible below: a subapical marginal row of five whitish oblong spots, arranged on the veins of which the apical ends are dull brown; and an outer marginal row of six dark-brown spots, also arranged on the veins and of which the lowest is the largest; a dull whitish fusiform spot on the inner angle which is very distinct on the underside: wings castaneous with a dark brown marginal border and some suffused dark-brown discal streaks extending across the wings (*Distant*).

6. PLATYPLEURA NICOBARICA, Butler.

J. A. S. B. liii, (2), p. 233.

Allied to *P. fulvigera*, Walker, from the Philippines, but larger, with tegmina longer; the whole of the spots crossing the coriaceous area, testaceous; those crossing its apex, smaller: the blackish transverse spots considerably smaller: the wings longer, the subapical, transverse, fasciolæ replaced by 3-4 decreasing longitudinal fulvous streaks: pronotum considerably broader, its lateral angles more oblique and therefore more prominent (*Butler*). Body long, 21: exp. teg. 77 millims.

7. PLATYPLEURA BASIALBA, Walker.

J. A. S. B. liii, (2), p. 214, no. 10.

♂. Body yellow, whitish pubescent, whitish pulverulous beneath: band in front and behind on the frons, also a stripe of short bands on each side, slender bands on the genæ, bands on the antennæ and their tips, seven small marks on the pronotum, three stripes on the mesonotum of which the side pair are oblique and the middle one straight, widened on each side by the fore border, and a small spot on each side near the hind border, black: eyes and antennæ tawny; ocelli red: abdomen black; drums, tip and hind borders of the segments yellow: legs yellow, briefly whitish pubescent; tips of claws black: hind tibiæ with tawny spines; first femora with two small teeth beneath: tegmina colourless, white at the base above, brown at the base beneath; from this brown hue a short tawny stripe proceeds along the hind border and communicates with an oblique brown band which crosses the tegmen near its base: wings colourless, dark brown with a whitish outline for near half the surface from the base which is tawny; flaps dark brown; veins tawny; piceous at the tips of the tegmina.

8. PLATYPLEURA OCTOGUTTATA, Fabricius.

J. A. S. B. liii, (2), p. 216, no. 13.

Head pallid with two dull-black parallel bands, three ocelli in the middle of the upper dilated band, two dots and a pale spot in the middle of the lower: thorax anteriorly rufous, a broad pallid band in the middle, posteriorly dull black with a great trifurcate spot, testaceous: abdomen black: tegmina at the base black; at the middle with four, large white spots 3-1; at the apex, hyaline: wings short, black, posterior margin, white *(Fabr.)*.

♂, ♀. Testaceous-flavescent, whitish sericeous: disc of thorax, testaceous: two bands on the head and spots on the scutellum, black: anterior band on the head in front spotted yellow: tegmina vitreous, scarcely basal half fuscous; spot near the apex of the radial area and anterior band, whitish, opaque; anastomoses margined fuscous; small spots (sometimes wanting) arranged in two subapical rows, fuscous: wings black-fuscous, veins sanguineous towards the base; broad veinless limbus colourless, vitreous; head very broad (*Stål*).

9. PLATYPLEURA SUBRUFA, Walker.

J. A. S. B. liii, (2), p. 216, no. 14.

♀. Body tawny: two stripes on the head of which the fore one forms a circlet on the face, a row of bands on each side of the face, tip of rostrum, the antennæ, two marks on each side of the scutellum, black: rostrum tawny reaching the hind coxæ: posterior lobe of the pronotum pale tawny, piceous; mesonotum with four black marks, side pair large and obconical, inner pair smaller and nearly round, a black dot behind each of the latter: posterior margins of the abdominal segments and the tip mostly black: legs tawny, claws paler with black tips; tegmina colourless with a broad white band one-third of the length from the base; the colourless part includes a brown band, its cross-veins are clouded with brown and there are two imperfect rows of brown dots on the tips of the longitudinal veins of the marginal areolets:

wings brown, tawny at the base with a broad, interrupted white band and a white spot at the tips; veins dark tawny, flaps brown.

Specimen from Nagar (Sind).

10. PLATYPLEURA BUFO, Walker.

J. A. S. B. liii, (2), p. 216, no. 15.

♂. Body tawny: two irregular bands on the head of which the hinder one passes over the region of the ocelli, tip of rostrum, the antennæ, and median mark on pronotum, black: rostrum tawny reaching the posterior margin of the drums: posterior lobe of pronotum pale tawny, ferruginous: mesonotum and abdomen ferruginous, the latter tawny at the tip and beneath: legs tawny, tips of claws, black; first femora armed with two very short and blunt tawny teeth: wings very ly tinged tawny, but tawny towards the base and bright tawny ong the costal margin; veins tawny, darker towards the tips; transverse veins darker.

11. PLATYPLEURA CERVINA, Walker.

J. A. S. B. liii, (2), p. 217, no. 16.

♀. Body and rostrum pale buff; tip of the latter black, reaching the hind coxæ: antennæ piceous, buff at the base: legs pale buff; claws black, tawny towards the base; first femora with small teeth; hind tibiæ with buff spines having black tips: tegmina and wings whitish, veins yellow, the former buff along the costal margin; transverse veins clouded brown and a row of brown dots on the tips of the longitudinal veins of the apical areas.

12. PLATYPLEURA HILPA, Walker.

Platypleura hilpa, Walker, List Hom. B. M. i, p. 6 (1850); Butler, Cist. Ent. i, p. 185 (1874).

Pœcilopsaltria hilpa, Stål, Berlin Ent. Zeitschr. x, p. 168 (1866).

Platypleura fenestrata, Uhler, Proc. Acad. N. S. Phil., p. 282 (1861).

Body in ♂, tawny and in ♀, dark tawny: a broad irregular band across the vertex, bands on the face, the rostrum, the antennæ, sides of the posterior lobe of the pronotum, four broad obconical stripes on the mesonotum of which the inner pair are not more than half the length of the outer pair and between these latter a conical stripe and behind them five spots of which two on each side of the middle one which is angular and joins the conical stripe above mentioned, parts of the pectus and the abdomen, black: abdomen at the tip beneath and opercula and drums in the ♂, tawny; the opercula rather large: legs very dark tawny, claws black towards the tips, first femora not spinose: tegmina and wings in ♂

paler than in ♀, the former nearly colourless, dark tawny towards the base with four broad irregular brown bands and along the hind border two connected rows of brown spots: wings dull tawny with two brown bands, the inner one broader than the other but not extending more than half across the wing; flaps tawny *(Walk.)* Long, 21; teg., 67 millims. Reported from China.

13. PLATYPLEURA HYALINOLIMBATA, Signoret.

Platypleura hyalinolimbata, Sign., Bull. S. E. F. (6 sér.), i, p. xlii (1881).

Close to *P. repanda*, Linn., from which it differs in having the wings entirely of a velvety blackish brown, bordered by a broad hyaline limbus, veins of a distinct yellow: tegmina with the flattened marginal space between the side and the veins broader than in *P. repanda*; the expansion of the pronotum is concave and sinuated below, whilst in *P. repanda* convex (*Sign.*).

Reported from China.

14. PLATYPLEURA REPANDA, Linnæus.

Cicada repanda, Linn., Syst. Nat. i (2) p. 707 (1766): Mus. Lud. Ulr. p. 159 (1764): Gmelin ed. Syst. Nat. i (3) p. 2097 (1782): De Géer, Mém. iii, p. 209, t. 33, f. 1 (1773): Olivier, Enc. Méth., V, p. 754 (1790): Germar, Thon's Arch. ii, fasc. 2, p. 220 (1830); Silb., Rev. Ent. ii, p. 78 (1834): Guérin in Tigny Hist. Ins. vi, p. 189 (1830).

Tettigonia repanda, Fabricius, Spec. Ins. ii, p. 321 (1781); Mant. Ins. ii, p. 267 (1787); Ent. Syst. iv, p. 23 (1798); Syst. Rhyng. p. 41 (1803).

Fidicina ? repanda, Walker, List Hom. B. M. ii, p. 90 (1851).

Platypleura ? repanda, Walker, l. c. Suppt. p. 13 (1858).

Tawny or yellowish brown; a black line and several small black patches on the thorax: opercula very large: abdomen black above: tegmina and wings tawny, transparent along the posterior margin near which is a series of transparent oval patches; tegmina have a like patch on the exterior border and a waved transverse line, brown in the middle. Body long, 27 millims.

Reported from India.

Genus TACUA, Amyot & Serville.

J. A. S. B. liii, (2), p. 217.

Head broad, as broad as the thorax, triangular, with a longitudinal groove in the middle of the frons: eyes stout, prominulous: entire lateral margins of thorax somewhat flattened out, anterior angles rounded, tegmina and wings entirely opaque: abdomen stout, tumid; opercula in ♂ very large, reaching at least the middle of the abdomen (*A. & S.*).

15. TACUA SPECIOSA, Illiger.

J. A. S. B. liii, (2), p. 217, no. 17.

Black: pronotum with a narrow border anteriorly and a broad posterior band yellow with a greenish tinge, posterior margin of mesonotal cruciform elevation and two spots confluent with the margin orange-yellow: abdomen black, 5-7 segments yellow above with a greenish tinge and with a rounded black spot on the fifth segment: tegmina black or brownish olive with a dark green tinge, veins sanguineous: wings black with a broad sordid whitish limbus: feet black.

Genus TOSENA, Amyot & Serville.

J. A. S. B. liii, (2), p. 217.

Head broad, triangular; frons very tumid without a longitudinal groove in the middle: eyes stout, prominulous: lateral margins of thorax very narrowly somewhat dilated, forming a tooth before the middle: the tegmina and wings entirely opaque with a weak, elevated, transverse line in the middle of each tegmen: abdomen stout, inflated; opercula as in *Tacua* (*A. & S.*).

16. TOSENA MELANOPTERA, White.

J. A. S. B. liii, (2), p. 217, no. 18.

In size and colour resembles *T. fasciata*, Fabr. (reported from Java) but in the latter, the veins of both tegmina and wings are of a very clear ferruginous colour, the band is obscure yellow, there is a ferruginous line (sometimes interrupted) on the front of the clypeus, the anterior margin of the pronotum has four small ferruginous spots and the tips of the femora are yellow. In *T. melanoptera*, White, the veins of the tegmina and wings are nearly entirely black, the band on the tegmina is whiter and generally broader than in *T. fasciata*, the clypeus is entirely black, there are no spots on the anterior margin of the pronotum, the yellow marks above the antennæ are smaller and the legs are of an uniform black (*White*).

17. TOSENA MEARESIANA, Westwood.

J. A. S. B. liii, (2), p. 217, no. 19.

Black: posterior margin of pronotum, yellow: mesonotum posteriorly on both sides with an oblong, ferruginous spot: metanotum margined fulvous: tegmina black fuscous, veins black: wings broadly testaceous: anal area and slender apical margin, fuscous; veins black (*Westwood*).

18. TOSENA ALBATA, Distant.

J. A. S. B. liii, (2), p. 217, no. 20.

General colour and markings of *T. melanoptera*, White, but tegmina with five longitudinal whitish fasciæ situate between the veins commencing near the base, two of which amalgamate with the broad median transverse band, and a subapical row of five irregular longitudinal fasciæ of the same colour, the first of which is placed at about one-third the length of the outer border from the apical point of the tegmina, and the last is fused into the median band near the inner margin. Wings as in *T. melanoptera*, but with a submarginal row of nine whitish fasciæ commencing near the costa, of which the seventh and ninth are largest, the last very much so; two-thirds of the outer border narrowly edged with the same colour (*Distant*).

19. TOSENA SPLENDIDA, *Distant.*

J. A. S. B. liii, (2), p. 217, no. 21.

♂ Body black: face with the lateral borders dull reddish, with a well-pronounced, central, longitudinal impression; transversely costate, with the interstices wide and irregularly punctate: eyes prominent, luteous and fringed behind with long hairs, pronotum deeply furrowed, much as in *T. melanoptera*, White, with four large luteous spots; two on the disc, sub-oval, converging from immediately behind the eyes towards each other, through two-thirds of the width of the pronotum, their bases widened and separated by a space of about two millimètres; the other two somewhat larger and much more irregular, occupying the posterior lateral angles; mesonotum very sparingly pilose (except near the lateral borders, where the hairs are much longer and more regularly abundant) and with two subcordate luteous spots on the disc, parallel with the pronotal central spots, and, like them, converging towards each other at base: metanotum with two small luteous spots at the base, very indistinct in ♂, but clearly exhibited in ♀: abdomen above pilose: rostrum black, with a small luteous spot near the base, in length just reaching the posterior coxæ. Body beneath and legs pilose; femora with a wide central, rufous band, fore-femoral spines apparently well developed: drums of the usual generic size, but situated close together, and divided by a very slight emargination behind: abdomen with a longitudinal discal row of sub-triangular reddish markings, the bases of which are situate on the posterior borders of abdominal segment. Tegmina and wings, where not obscured by darker markings, transparent, exhibiting varied opaline lustre, which in some lights is found to be varied with a close and regular series of transverse darker striæ:

tegmina at base narrowly dark fuscous: costal area fuscous for rather more than half its length, veins and veinlets bright luteous, and for two-thirds the length of the tegmina, bordered on each side with fuscous: the apical border is also fuscous, very broadly so at the apex, and narrowing towards the inner margin, containing a sub-marginal row of pale luteous spots, which are the outer terminations of an equal number of narrow transverse linear, pale luteous striæ: claval area greenish: wings pale greenish for nearly two-thirds their area from the base, remaining portion shining fuscous, enclosing a sub-marginal row of pale opaline spots, of which the largest is sub-costal and irregular in shape, being somewhat sub-quadrate, hollowed out externally, and produced at the base towards the outer edge: veins and veinlets pale luteous, in some places tinged with green.

♀. Differs principally from the ♂ in having all the colour markings intensified, the tegminal row of sub-marginal spots, which are luteous in the ♂ being pale opaline in the ♀: the abdomen is more thickly clothed with pilosity and the rostrum is somewhat shorter in length than in the ♂. *(Distant).*

♂. Differs from the others in its paler coloration and more transparent appearance but the last peculiarity is shadowed in *T. albata*, Dist. whilst the pronotal and mesonotal spots which ally it to *Gæana* may be seen indicated on the pronotum of *T. melanoptera*, White in which the two discal spots are jointly recognizable whilst the broad pronotal luteous band of that species appears only as two angular spots in *T. splendida.*

Genus HUECHYS, Amyot & Serville.

J. A. S. B. liii, (2), p. 218.

Body slender: head small, triangular, as broad as the pronotum; frons angular, slightly compressed on each side, furnished with a distinct abbreviated longitudinal groove: eyes stout, slightly prominulous: the lateral margins of the thorax not dilated unless anteriorly and not dentated: tegmina entirely opaque, ulnar veins distant at the base: abdomen elongate *(A. & S., Stål).*

20. HUECHYS PHILÆMATA, Fabricius.

J. A. S. B. liii, (2), p. 218, no. 22.

Black: frons, scutellum on both sides and the abdomen, sanguineous: wings fuscous-diaphanous. Differs from *H. sanguinolenta*, Fabr. (same as *H. sanguinea*, De Géer) in its larger size, and in having the red frons immaculate; scutellum red; and dorsal streak, black: tegmina dull black not piceous and the wings smoky-diaphanous *(Fabr.)* Head thorax and feet, black; entire frons, two large patches on the mesonotum and the abdomen, red: tegmina black, tip sordid white: wings smoky *(A. & S.)*

21. HUECHYS SANGUINEA, De Géer.

J. A. S. B. liii, (2), p. 218, no. 23.

Head, thorax, pectus and feet, black, shining: frons, rounded, red: entire abdomen red: thorax with two large patches in the shape of elevated plates, red, of the colour of sealing-wax: eyes and oviduct in the ♀, brown: tegmina, elongate, somewhat broad, of a very obscure brown approaching black; longitudinal veins black, distinct: wings transparent of a brownish tint, veins black: ocelli three, pale red: antennæ short, setiform, situate on a much stouter cylindrical part: tegmina longer than the abdomen, wings a little shorter *(De Géer)*.

Head black: frons rufous, a longitudinal line and the rostrum, black: thorax glabrous, black; a rounded spot on both sides, red: abdomen red: tegmina and wings obscurely fuscous immaculate: feet black *(H. sanguinolenta,* Fabr.). Black, frons sanguineous, anteriorly black: two spots on the mesonotum and the abdomen: tegmina and wings, white; veins black *(H. incarnata,* Germar). This species is reported from India and Germar remarks that it may be a variety of *C. sanguinolenta*, Fabr. from which, however, it differs in the white, black veined, tegmina, having the apical veins narrowly cinctured fuscous, and the white, black-veined wings broadly margined fuscous. *H. Germari*, Gúerin, is probably also only a variety of this (Mag. Zool. p. 78; t. 237, f. 2, 1839):—Black, frons sanguineous, anteriorly black: two spots in the mesonotum and the abdomen, red: tegmina white, veined black, apical veins narrowly cinctured fuscous: wings black-fuscous, posterior lobe subhyaline *(Guérin)*. Reported from Java.

22. HUECHYS STELLATA, Walker.

Huechys stellata, Walker, Ins. Saund. Hom. p. 27 (1858).

Black: head with two testaceous spots between the eyes: mesonotum with six testacous spots, four in the middle and two behind: tegmina with two broad, irregular, fawn-coloured bands which are connected on the costa, a middle interrupted white band consisting of three large spots which are partly enclosed by the second broad band; ten exterior white dots on as many areolets: wings with five white dots *(Walker)*. Body long, 31-2: teg. 92 millims.

Reported from India.

23. HUECHYS PICTA, Walker.

Huechys picta, Walker, Ins. Saund. Hom. p. 28 (1858).

♂, ♀ Black: head with two testaceous bands: pronotum with a testaceous band on the hind border which is broad in the ♀ and extends in the middle to the fore border: mesonotum with a testaceous border and with two testaceous stripes which are broader in the ♀: abdomen red with a black dorsal stripe: tegmina blackish, with a testaceous discal spot near the base, an interrupted testaceous band and two exterior subcostal dots: in the ♀ the discal spot is almost obsolete and there is only one dot: wings crimson, with black borders (*Walker*). Body long, 19—21; teg. 50—52 millims.

Reported from Assam, Java.

Genus SCIEROPTERA, Stål.

J. A. S. B. liii, (2), p. 220.

Head scarcely narrower than the base of the thorax; frons slightly tumid occupying a little more than one-third of the breadth of the face, without a longitudinal furrow; vertex more than twice broader than the eyes: the ocelli as far from the eyes as from each other or a little farther: rostrum not extended behind the intermediate coxæ: first femora stout, spinose beneath; first tibiæ somewhat equal in length to the femora: six apical areas, ulnar veins contiguous at the base or united for a short space *(Stål)*.

24. SCIEROPTERA CROCEA, Guérin.

J. A. S. B. liii, (2), p. 220, no. 29.

Yellow: head obscure brunneous; spots red: thorax yellow; pro- and meso-notum each with two very large reddish-brown spots: abdomen croceous, more obsolete beneath; feet yellow; tibiæ and tarsi, black: tegmina and wings hyaline, veins yellow, anterior veins with the membrane close to the veins, pale yellow *(Guérin)*.

25. SCIEROPTERA SPLENDIDULA, Fabricius.

J. A. S. B. liii, (2), p. 220, no. 30.

Small: head black; eyes pale: thorax pale, with two large rounded black spots: scutellum black, margin pale: abdomen red: tegmina fuscous with a very vivid golden reflection: first femora black, tibiæ very stout, dentated, red: last pair of feet black, femora red (*Fabr.*).

Genus GRAPTOTETTIX, Stål.

J. A. S. B. liii, (2), p. 221.

Vertex twice as broad as the eyes; frons tumid, prominulous, somewhat compressed; ocelli as far from each other as from the eyes: thorax narrowed forwards, at the apex a little broader than the head: rostrum extended scarcely beyond the intermediate coxæ: first femora spinose beneath; first tibiæ longer than the femora: tegmina with ten apical cells, ulnar veins distant at the base (*Stål*).

Genus GÆANA, Amyot & Serville.

J. A. S. B. liii, (2), p. 221.

Body elongate: head triangular, narrower than the base of the thorax; frons tumid, prominulous, rounded, not compressed at the sides, nor grooved: pronotum not dilated: tegmina and wings entirely opaque, the former furnished with eight apical areas, the ulnar veins distant at the base (*A. & S., Stål*).

26. GÆANA SIBYLLA, Stål.

Gæana sibylla, Stål, Trans. Ent. Soc. (3 ser.) i. p. 576 (1863).

♂ Black: tegmina somewhat olivaceous yellow from the base scarcely to the middle: wings beyond the middle, lutescent. Stature of *G. maculata*, Fabr.: frons very tumid: thorax anteriorly somewhat narrower than the head, sides parallel from the apex to the middle, thence abruptly amplified: the costa of the tegmina and the subcostal vein rather distant from each other throughout their entire length, ulnar veins rather distant at the base; apical areas very long, the first, fourth and sixth of equal length: opercula somewhat triangular, rounded at the apex (*Stål*). Long 42; exp. teg., 112 millims.

Reported from Tringany.

27. GÆANA OCTONOTATA, Westwood.

J. A. S. B. liii, (2), p. 221, No. 33.

Black: frontal and posterior band on the head and a posterior band on the pronotum and the mesonotum yellowish, the last with two irregular yellowish lines: abdomen sanguineous, basal segments spotted above with black in the middle: tegmina fuscous-blackish, each with four whitish spots and very fine red veins: wings sanguineous with black lines (*Westw.*).

28. GÆANA FESTIVA, Fabricius.

J. A. S. B. liii, (2), p. 222, no. 36.

Antennæ testaceous: head dull black, a spot on both sides in the ocular area, ferruginous: thorax dull black, anterior margin and broader posterior margin of the anterior lobe yellow and the posterior lobe striated yellow: abdomen dull black, immaculate: tegmina fulvous, veins whitish, a median band and the apex on both sides emitting a tooth like mark, dull black: wings white, dull black at the apex, with a large white spot: feet dull black (*Fabr.*).

29. GÆANA SULPHUREA, Hope.

J. A. S. B. liii, (2), p. 223, no. 38.

Black: head and thorax spotted sulphureous: basal half of wings sulphureous (tegmina divided by an oblique blackish band), apices yellowish-fuscous, veins in the obscure parts black (*Hope*). The tegmina are broadly wrinkled and the drum covers in the ♂ are small, leaving the striated internal membrane broadly exposed.

The following scheme attempts to provide a rough differentiation of some of the genera of clear-winged *Cicadæ* found in India based on Stål's analysis :—

A. Anterior margin of posterior part of the first dorsal segment of the abdomen in ♂ emitting a foliaceous lobe which covers the whole or part of the tympana or is dilated forwards more or less towards the sides. Body oblong or somewhat elongate: first femora spinose or acutely dentate beneath: frons usually more or less convex.

B. (1) Thorax narrowed forwards, lateral margins very often armed with a small tooth before the middle: (2) basal cell of tegmina more than twice longer than broad: (3) interior ulnar area not or but very slightly amplified towards the apex: (4) the ulnar veins very close at the base or contiguous.

I. DUNDUBIA group. A and B above.

1. *Leptopsaltria*: genæ internally near the apex at the base of the lores furnished with a tubercle or tumescence: rostrum reaching a little behind the last pair of coxæ: interior ulnar area of the tegmina not or only very slightly narrowed towards the apex: first pair of tibiæ longer than the femora: tympana above covered by a very large lobe: opercula short: second and third ventral segments in ♂ with a lateral tubercle. The head is narrower than the thorax and the frons is moderately convex.

2. *Dundubia*: genæ without a tubercle: rostrum not or scarcely reaching the base of the last pair of coxæ: the opercula are long and

extended beyond the middle of the venter. The frons is large, very convex and near the base is almost twice as broad as the anterior margin of the lobes of the vertex.

3. *Cosmopsaltria :* genæ without a tubercle : rostrum extending beyond the base at least and very often beyond the apex of the last pair of coxæ : the opercula are long and extended behind the middle of the venter. The frons near the base is not or only somewhat broader than the apical margin of the lobes of the vertex.

4. *Pomponia* : genæ without a tubercle : rostrum and frons as in *Cosmopsaltria* : opercula short, somewhat transverse.

II. CICADA group. A as above.

B. (1) The lateral margins of the thorax always without a distinct tooth : (2) basal cell of tegmina rarely (*Cicadatra*) twice longer than broad, very often broad : (3) the interior ulnar area gradually distinctly amplified towards the apex, seldom (*Emathia*) equally broad towards apex and base : (4) the ulnar veins distinctly (often very) distant at the base.

1. *Cryptotympana :* first apical area extended more forwards than the second : the transverse vein closing the base of the second apical area, very oblique : the space lying between the postcostal marginal vein and the postcostal ulnar ramus linear and not broader towards the apex : the basal cell of the tegmina somewhat (but rarely twice) longer than broad : tympana entirely hidden : metasternum elevated in the middle and furnished with a posterior process turning backwards.

2. *Cicada* : as in *Cryptotympana*, but the metasternum is not or is only a little elevated in the middle and there is no posterior process. The clypeus is truncated at the apex or somewhat sinuately truncated.

3. *Cicadatra :* as in *Cicada*, but the basal cell of the tegmina is twice longer than broad and the tympana are partly visible. The clypeus too is somewhat acuminated or a little rounded at the apex.

4. *Emathia :* the first and second apical areas are extended to an equal distance forwards, the second is, however, longer than the first, the interior basal angle of the first area and the exterior basal angle of the second area are both obtuse : the interior ulnar area is not amplified towards the apex of the tegmina and is equally broad at base and apex : the thorax anteriorly is scarcely narrower than the head and is amplified at the base : the tympana are for a great part visible : opercula short : rostrum scarcely reaching the last pair of coxæ : first pair of femora spinose.

III. TIBICEN group.

Tympana entirely visible ; the anterior margin of the sides of the posterior part of the first dorsal segment of the abdomen is not produced and does not send out forwards a lobe.

1. *Tibicen:* ulnar veins distant towards the base, diverging from the base: first apical area of the tegmina produced further forwards than the second: costa and radial vein contiguous towards the apex; veinless limbus of tegmina and wings moderate.

2. *Melampsalta*: ulnar veins contiguous at the base itself or united towards the base: eight apical areas: first and second apical areas of the tegmina equally long and equally extended forwards: space between the postcostal marginal vein and postcostal ulnar ramus, linear.

30. DUNDUBIA MANNIFERA, Linn.

J. A. S. B. liii, (2), p. 223, no. 39: liv, (2), p. 116. *D. nigrimacula*, Walker (List Hom. B. M. i, p. 63) reported from Java and *D. sobria*, Walker (l. c. p. 63) reported from Hongkong are local forms of this species.

Pale subolivaceous-virescent or flavescent: frons very tumid: the dorsum of the abdomen marked by fuscous lateral spots: opercula in ♂ elongate, contracted near the base, very broad behind the middle, rounded at the apex (*Stål*). Body large, testaceous, immaculate: tegmina obscurely whitish, immaculate, costa black: opercula elongate, almost as long as the body, arched, testaceous, armed at the base with a robust, acute, incumbent spine (*Fabr.*). Head, eyes, and part of thorax, also the abdomen, of a light brown above; the rest of the body greenish: tegmina and wings transparent, greenish, spotless: opercula very large, almost as long as the abdomen (*Olivier*).

31. DUNDUBIA MICRODON, Walker.

J. A. S. B. liii, (2), p. 224, no. 40.

♂ Body black: head with a tawny and green stripe in front and with an irregular green circlet on each side of the ocelli: face above with a short yellow stripe and with yellow bands in front: rostrum tawny, tip black, reaching the hind coxæ: antennæ black: pronotum green, with four slightly waved black stripes, outer pair very short, furrows black; posterior lobe green widened and slightly angular on each side in front of which is a very small tooth: mesonotum with four green stripes, the outer pair much longer than the inner pair, a green dot near each side which like the hind border is green: pectus tawny: abdomen black, brown beneath, posterior margins of the segments green: [drums black; opercula dull green, blackish towards the tips, tapering, very long, not far apart, more than half the length of the abdomen?]: legs tawny; femora striated black: fore-tibiæ, feet, and the tips of the other tibiæ, black; fore-femora with three black teeth of which two are long and one very small; a tawny band on the intermediate feet: wings colourless, green at the base; the first and second transverse veins clouded brown; a row of pale brown spots on the tips of the longitudinal veins of the apical areas; veins black; flaps with an opaline lustre.

32. DUNDUBIA VIBRANS, Walker.

J. A. S. B. liii, (2), p. 224: liv, (2), p. 116.

♂ Body pale tawny, rather long: head a little narrower than the pronotum, with an irregular and interrupted black band; face with black bands on each side; rostrum tawny, tip black reaching the hind coxæ: eyes prominulous: antennæ black: pronotum broadest near the base of the tegmen, with four crooked black streaks, the outer pair short, the sutures also blackish, posterior lobe widened with two large black spots above the base of each tegmen, slightly notched and with a moderate sized tooth on each side: mesonotum with five black stripes, a slight black streak in front between the two side pairs which are slightly oblique, the inner pair much shorter than the outer pair which are almost interrupted: abdomen nearly linear, rather long, with a short black stripe at the base and on each side of the tip, disc of the segments, piceous: drums tawny, close; opercula, bright tawny, bordered with black, about half the length of the abdomen, narrow towards the base, widened towards the tips: legs pale tawny, clothed with paler hairs: tips of the tibiæ and of the feet, piceous; tips of the claws, black; fore femora with three teeth, two large and one small; posterior tibiæ with black spines: tegmina and wings colourless, pale tawny at the base; the tegmina slightly clouded with brown at the tips, the first and second transverse veins clouded with brown, an almost imperceptible brown streak on each apical area; veins partly black, partly tawny, the latter colour prevailing most towards the base; flaps pale tawny at the base.

33. DUNDUBIA NICOMACHE, Walker.

J. A. S. B. liii, (2), p. 224, no. 44.

♂ Body black, nearly linear, tawny beneath: head with two zigzag marks behind the ocelli, a long angular stripe on each side between the eyes, a short stripe on the face, and on each side bands along the whole length, rostrum (tip excepted), lateral stripe, and four large oblique spots on anterior lobe of pronotum, the posterior lobe, and 3-4 irregular streaks on the mesonotum which vary in length and breadth, tawny: tip of rostrum which reaches beyond the hind coxæ, antennæ, sickle-shaped spots on the tawny spots of the anterior lobe of the pronotum, and three large spots near the base of each tegmen, and the abdomen, piceous: drums tawny, close; opercula tawny obconical, very large, a little apart, more than two-thirds the length of the abdomen: posterior margins of the abdominal segments and the underside, tawny, tip piceous: legs tawny; feet ferruginous, claws black, ferruginous towards the base first femora with three tawny teeth, one very small: tegmina colourless, long, narrow, costal margin tawny; veins tawny with two black bands across the disc beneath the stigma, black towards the tips, marked with black at the base; fore-flaps and hind flaps at the base and for a space along the hind border, pale tawny with a brownish tinge.

34. DUNDUBIA TIGRINA, Walker.

J. A. S. B. liii, (2), p. 224, no. 45.

♂ Body tawny, nearly linear, pale sericeous: head with a slight ferruginous tinge above: vertex with four black stripes, the middle pair contiguous, partly united between the ocelli, side pair nearly round on proceeding from the base of the antennæ, thence narrower and slightly curved: a black band on each side of the face; rostrum tawny, tip black, extending a little behind the hind coxæ: antennæ black: four black stripes on the anterior lobe of the pronotum of which the median pair slightly converge from the fore to the hind border, the outer pair are more oblique, posterior lobe very narrow in the middle with a black spot: mesonotum with five slender black stripes, the median entire, inner pair much and outer pair slightly interrupted: abdomen ferruginous above; posterior margins of the segments, piceous; beneath tawny, piceous at the base and tip: drums tawny, close; opercula black, small, far apart, outer margin tawny: legs tawny; femora striped black; tips of the tibiæ, piceous; claws black, ferruginous at the base; fore and middle feet black, last pair ferruginous, first femora with three black teeth, one small: tegmina colourless, long, narrow; costal margin bright ferruginous as far as the stigma, thence to the tip, piceous; veins black, ferruginous towards the base, the first and second transverse veins clouded brown, a row of brown spots along the tips of the veins of the apical areas, all indistinct except first and second; fore flaps grey, hind flaps grey at the base and for a distance along the hind border.

35. DUNDUBIA (?) MACULIPES, Walker,

J. A. S. B. liii, (2), p. 224, no. 46.

♂ Body tawny, whitish pubescent: two interrupted black bands across the vertex; furrows on face, black: rostrum pale tawny, tip black, reaching far beyond the hind coxæ: two black stripes on the anterior lobe of the pronotum, its sides and the furrows also blackish: mesonotum with two U-shaped marks and behind each a dot and on each side an oblique stripe, all black: abdomen with four rows of black spots, two in the middle and one on each side; posterior margins of the segments and the tip, partly black: drums small, blackish, tymbals white: opercula large, pale tawny, slightly overlapping, rather less than half the length of the abdomen: legs pale tawny, with a piceous band near the tip of each femur and tibia, the latter has a similar band near the base: feet tawny, piceous at the base, black towards the tips; femora streaked with black and with one black and one tawny tooth: tegmina colourless, pale tawny and marked black at the base, costal margin green; veins green, black towards the tip; transverse veins black, strongly marked and 1-4 clouded brown; a row of small brown spots near the tips of the longitudinal veins of the apical areas: hind flaps pale brownish, tawny towards the base and for a distance along the hind border.

36. DUNDUBIA (?) SAMIA, Walker.

J. A. S. B. liii, (2), p. 225, no. 47.

♂ Body green, tinged here and there with tawny: ocellar area piceous and a piceous streak on each side along the eye: rostrum tawny, tip black, reaching beyond the hind coxæ: antennæ tawny: a pale streak slightly widened in front and behind on the anterior lobe of the pronotum and a piceous spot on each side: mesonotum ferruginous with some green marks, of which there is a large angular spot in the middle, on each side a forked mark, behind which there is a curved mark, and nearer each side, a slight streak: abdomen tawny, darker at the tip, paler beneath: drums tawny, small; opercula pale-green, small, far apart: legs tawny; tips of the claws, black; femora with three teeth, one very small: tegmina colourless, costal margin green, tawny beyond the stigma; veins green, with a few black bands, tawny towards the tips; transverse veins clouded pale brown; a row of pale brown spots near the tips of the longitudinal veins of the apical areas: fore-flaps and the hind flaps between the middle-veins and the fore-border, brown.

37. DUNDUBIA (?) SINGULARIS, Walker.

J. A. S. B. liii, (2), p. 225, no. 48.

♂ Testaceous, slender, partly green, very pale beneath: interocellar space and a dot on each side of the head in front and two dots near the border of the pronotum, black: mesonotum with an oblique green stripe on each side: abdomen with four rows of triangular, brown, spots: opercula small: tegmina and wings vitreous, with testaceous streaks between the apical anastomoses and the border, veins green or testaceous: tegmina narrow with the transverse veins and the forks of the longitudinal veins, clouded testaceous; a testaceous spot at the tip of each marginal vein communicating with a slight testaceous streak on each apical area a testaceous dot on the hind side of the third ulnar area with distinct indications of two transverse veins one joining the fifth anastomosis and the other ending on the front areola near the base of the second ulnar area; a few minute testaceous dots on some of the marginal and discoidal veins.

38. DUNDUBIA OCHRACEA, Walker.

Fidicina ochracea, Walker, List Hom. B. M. i, p. 99 (1850).
Cicada ferrifera, Walker, l. c. p. 115 (1850).
Dundubia fasciceps, Stål, Ofvers. K. V.-A. Förh. p. 242 (1854); p. 481 (1862).

♂ Sordid yellow; intraocular apical band on the head, blackish: tegmina more than half longer than the abdomen, whitish-hyaline, veins flavescent: below with feet yellowish-white: opercula one-half shorter than the abdomen, subparallel, rounded at the apex (*Stål*). Body long, 26 millims.

Reported from China: the Indian Museum possesses a specimen.

39. DUNDUBIA RADHA, Distant.

J. A. S. B. liii, (2), p. 225, no. 49.

♂ Body above pale castaneous: head with the area of the ocelli black; pronotum with the lateral and posterior margins and a very narrow anterior margin, ochraceous, the last is inwardly margined by two small, transverse, linear, black spots and the posterior margin has also a very narrow discal inner border of the same colour: mesonotum with a large median, obconical spot on the anterior margin, with a very indistinct median line and with the lateral margins black, outwardly marked with ochraceous; five indistinct basal spots, three within the anterior angle of the cruciform elevation and one on each side of the same: abdomen rather darker in colour with the segmental sutures piceous. Underside of the body concolorous, opercula dull ochraceous: tegmina with the costal membrane and claval area dull ochraceous: wings with the base narrowly of the same colour. The body is much elongated, the head including the eyes, a little narrower than the base of the pronotum; the face is prominently convex, faintly longitudinally furrowed and transversely striated: the rostrum reaches the middle of the posterior coxæ: the opercula are very long, reaching the penultimate abdominal segment, they are abruptly narrowed on the first abdominal segment, then gradually amplified and rounded on each side, maximum width being at the junction of the second and third abdominal segments from whence they are gradually narrowed to the apex which is obtusely rounded (*Distant*).

40. Dundubia tripurasura, Distant.

J. A. S. B. liii, (2), p. 225, no. 50.

♂ Head, pronotum, and mesonotum ochraceous: frons with a triangular black spot near the base, and transverse black striæ which do not meet in the middle, vertex with two large oblique and irregular black fasciæ on the disc, and a large irregular black spot on the inner margin of the eyes: pronotum with two median longitudinal black fasciæ, and three oblique black striæ on each side, the outer one submarginal and somewhat rounded: mesonotum with a large median clavate spot, of which the apex terminates on the anterior margin, bordered on each side by a subconical spot, followed by a small triangular one, and a wide submarginal fascia, black: abdomen dull sanguineous, with a series of discal segmental black fasciæ (these are much larger in some specimens and subconfluent) and a lateral segmental row of irregular black spots. Body beneath with the sternum ochraceous, covered with greyish pubescence: abdomen dull sanguineous; opercula pale sanguineous; legs ochraceous: tegmina and wings pale hyaline. Frons very prominent and convex; head, including eyes, narrower than the base of the pronotum, subequal to the mesonotum in width: opercula subtriangular, well separated at the base, gradually becoming more divergent, and narrowing to the apex, which is obtuse, and almost reaches the apex of the fourth abdominal segment: anterior femora armed with three spines; two moderately large and ochraceous; apical one small and black; posterior tibiæ with three black spines on the inner side near the apex, and two smaller and wider apart on the margin (*Distant*).

41. Dundubia nagarasingna, Distant.

J. A. S. B. liii, (2), p. 225, no. 51.

♂ Body above castaneous: head with the middle of the frons and an oblique fascia on each side of the ocelli, ochraceous: pronotum with a median band and lateral and posterior margins, ochraceous: mesonotum with two anterior median obconical spots denoted by black margins; margins of basal cruciform elevation, ochraceous: abdomen with the basal half sparingly clothed with greyish pile, the apical half much more densely so, and with a broad lateral fascia of greyish pile on each side: body beneath, with the sternum, legs, and opercula, pale ochraceous; abdomen pale castaneous. Tegmina and wings pale hyaline; costal membrane of tegmina ochraceous: head broad, including the eyes subequal in width to the base of the pronotum, and wider than the mesonotum; the face is very tumid, the middle longitudinally sulcated for half the length, and the sides transversely striated; rostrum reaching the apex of the posterior coxæ; opercula long, reaching the base of the last abdominal segment, narrowest and with the edges concave from base to the commencement of the second abdominal segment, from which they are somewhat abruptly widened with the edges convex and the apex somewhat narrower and rounded: anterior femora with two long ochraceous spines; posterior tibiæ with two long black spines, somewhat close together on the inner margin near the apex and two much wider apart on the outer margin *(Distant)*.

42. DUNDUBIA TERPSICHORE, Walker.

J. A. S. B. liii, (2), p. 233, no. 94: liv, (2), p. 117.

♀ Body pale green, slightly tinged with tawny, slightly clothed with white shining down: a black dot on each side of the ocelli: rostrum pale tawny, tip piceous, reaching a little beyond the intermediate coxæ: antennæ tawny: mesonotum with a piceous dot on each side above the cross-ridge: two last segments of the abdomen above and the oviduct, piceous: legs pale tawny tinged with green; claws black towards the tips; first femora with two tawny teeth of which one is small: tegmina and wings colourless, tinged with brown towards the tips, costal margin of tegmina green, slightly spinose, middle part black; veins black, green towards the base, black along the hind border of the tegmina,; flaps buff and tinged with red at the base and for some distance along the hind border.

43. DUNDUBIA (?) EVANESCENS, Walker.

Dundubia evanescens, Walker, Ins. Saund. Hom. p. 6 (1858).

♂ Pale testaceous, slender: head with a black band, and with the usual black marks in front: pronotum with two approximate black stripes and with two black spots on each side: mesonotum with nine black stripes which are more or less abbreviated hindward where there are two black dots: abdomen with six stripes of black spots; the second pair of stripes incomplete: opercula nearly half the length of the abdomen: tegmina and wings vitreous, veins pale testaceous; tegmina with the marginal veins clouded by brown stripes which successively decrease in length, first and second transverse veins clouded with brown, very oblique, third and fourth oppositely oblique, slightly curved or undulating: wings very slightly clouded with brown along the transverse marginal veinlets *(Walker)*. Body long, 21—23; teg., 51—55 millims.

Reported from India.

44. DUNDUBIA (?) GUTTIGERA, Walker.

Dundubia guttigera, Walker, J. Linn. S. Zool. i, p. 83 (1856).

Testaceous: head with three angular stripes and an elliptical ringlet in front and on each side of it transverse lines, two dorsal nearly parallel stripes on pronotum, five stripes on the mesonotum of which the inner pair are abbreviated and the outer pair are interrupted, black: opercula small, rounded: abdomen ferruginous: tegmina and wings vitreous, the former with a brown spot on each transverse veinlet and on the tip of each marginal vein *(Walker)*. Body long, 23; exp. teg. 71 millims.

Reported from Malacca, Singapore.

Genus MELAMPSALTA, Kolenati, Stål.

J. A. S. B. liii, (2), p. 225.

Head somewhat as broad as the anterior breadth of the thorax; vertex about twice as broad as the eyes: frons slightly or moderately convex, furnished with a more or less distinct, median, longitudinal groove: thorax broader posteriorly than anteriorly, the lateral margins obtuse, rarely a little dilated: ulnar veins of the tegmina contiguous at the base or united towards the base: eight apical areas, basal cell quadrangular: last ventral segment in ♀ very deeply and broadly emarginate at the apex: tympana entirely visible above: opercula small or moderate: first pair of femora beneath 3—4 spinose *(Stål)*.

Genus COSMOPSALTRIA, Stål.

J. A. S. B. liii, (2), p. 226.

The subgenera founded by Stål (l. c.) are thus distinguished:—

a. Frons very tumid, seen from above distinctly produced before the juga: clypeus rounded at the apex or narrowly roundly subtruncated.

b. Thorax broad anteriorly, entire lateral margins distinctly amplified, ramus of the interior ulnar vein distinctly curved towards the base:—*Platylomia*, Stål *(C. flavida*, Guérin).

b b. Thorax much narrowed anteriorly, lateral margins not or only very slightly amplified: ramus of the interior ulnar vein straight or slightly curved: *Cosmopsaltria*, Stål (*C. spinosa*, Fabr.)

a a. Frons slightly convex, not or but very slightly prominulous before the juga: last dorsal segment in ♂ acutely dentated on both sides at the apex: clypeus narrowly truncated or sinuately truncated at the apex:—*Diceropyga*, Stål (*C. obtecta*, Fabr.).

45. COSMOPSALTRIA OBTECTA, Fabricius.

J. A. S. B. liii, (2), p. 226, no. 54.

Head virescent with a black vertical cross and on this the usual ocelli: the thorax green, the anterior lobe with small impressed lines, the posterior lobe with five more distinct abbreviated lines: abdomen virescent, furnished beneath with opercula which are arched, elongated, cinereous and armed at the base with a robust, acute spine: feet virescent with black lines (*Fabr.*).

♂ Weak olivaceous-virescent: an interior marginal spot beneath the middle of the lores; the extreme interior margin of the genæ at the frons; four transverse, lateral, subbasal lines on the frons terminated inwards by a longitudinal line and united, interior apical angle and median subapical spot on the juga; a narrow median band slightly verging forwards on both sides and spots on the vertex including the ocelli, two narrow median streaks very slightly diverging before the middle posteriorly slightly arcuated not extended behind the posterior transverse impression, a small median, lateral discoidal streak on both sides, a small oblong obliquely longitudinal spot behind the lateral oblique median impression, also a streak near the lateral margins of the thorax, three median longitudinal lines (the middle one near the apex of the scutellum the lateral ones abbreviated in the middle of the scutellum), all reaching the base, the lateral ones slightly converging backwards, four small basal spots situate towards the sides, an obliquely longitudinal line abbreviated on both sides, situate behind the exterior basal spot and two small spots placed behind the middle of the scutellum, an irregular spot on the first dorsal segment of the abdomen, two lines (one interior, the other exterior) also two spines on the first pair of femora, an abbreviated upper anterior line on the posterior femora and an indistinct band near the apex of the posterior tibiæ, blackish. A median band and lateral spot (sometimes very obsolete) on the dorsal segments of the abdomen, fuscous-testaceous: tegmina and wings somewhat sordidly vitreous: veins fuscous, olivaceous-virescent towards the base; the apex of the exterior ulnar vein flavescent at the costa; the two exterior anastomoses with a fuscous limbus.

♂ Apical angles of the last dorsal anal segment produced in a long lobe, gradually acuminated, the lobes below and towards the apex fuscous, inferior anal segment obtusely emarginate at the apex: opercula about one-third shorter than the abdomen, beyond the middle towards the apex gradually, thence more abruptly narrowed, inwardly behind the middle rounded, outwardly straight, rounded at the apex, olivaceous-flavescent: second ventral segment armed at the apex in the middle of the sides with a much elevated tubercle. Head equal in breadth to the posterior part of the thorax, anteriorly very obtusely rounded: frons seen from above truncated, scarcely prominulous before the juga, slightly convex, sides distinctly furrowed: thorax somewhat narrowed forwards beyond the middle, thence forming an angle prominulous in a minute tooth, anteriorly more narrowed: tegmina extending beyond the abdomen by half their length; the first anastomosis rather oblique, interior ulnar area gradually very slightly narrowed towards the apex, much obliquely truncated at the apex, interior apical angle obtuse, somewhat rounded: first pair of femora bi-spinose beneath (*Stål*).

46. COSMOPSALTRIA SITA, Distant.

J. A. S. B. liii, (2), p. 226, no. 55.

♂ Head, frons with a central fascia furcate anteriorly and an oblique spot on each side at the base; vertex with a large triangular spot inclosing the ocelli and an irregular longitudinal fascia near the inner margin of the eyes, black: pronotum with two central longitudinal fasciæ joined and rounded near posterior margin, widened and angulated near anterior margin, on each side of these is a small discal waved line and two oblique fasciæ near the lateral margins (the outer one submarginal and rounded) black: mesonotum with a central longitudinal fascia, on each side of which is a clavate, smaller and suboblique fascia, followed by two linear spots on the anterior margin and a discal waved irregular fascia on each side. Abdomen with the segments (excluding first) more or less piceous at the base and with a lateral segmental row of piceous spots: body beneath ochraceous and unicolorous. Tegmina and wings pale hyaline, the former with the venation of the basal half, ochraceous, and of the apical half, fuscous; transverse veins at the base of the 2-3 apical areas, fuscous-ochraceous at the junction. The head, including the eyes, is considerably narrower than the base of the pronotum, the face is only moderately convex, furrowed from beyond the middle, the sides distinctly striated (the face has also an oblong spot bordered with black at the base and the upper striæ are also of that colour). Opercula reach the third abdominal segment, they are moderately truncate outwardly, widened and angulated inwardly (but not meeting) on the first abdominal segment and then diverging and narrowing to the apex which is obtuse and rounded; the inner margin is slightly convex: rostrum reaching a little beyond the last coxæ: anterior femora with two strong spines (*Distant*).

47. COSMOPSALTRIA DURGA, Distant.

J. A. S. B. liii, (2), p. 226, no. 56.

♂ Head, pronotum, and mesonotum dull ochraceous: head with the following black markings; an irregular spot on the frons, a large central fascia on the vertex, reaching from the anterior to the posterior margins, produced on each side in front, enclosing the ocelli ; a curved fascia a little before the inner margin of the eyes, and a subtriangular spot on the apex of the lateral margin : pronotum with the anterior margin (narrow), a central longitudinal fascia, bordered with black on each side, and a triangular fascia on each lateral margin, pale ochraceous ; two narrow oblique fasciæ on each side, a narrow longitudinal fascia on each side of the disc, inner posterior, and inner and outer lateral margins, black : mesonotum with a clavate central longitudinal fascia, bounded on each side by a shorter, broader, and much angulated one, followed by an elongated spot and by a sublateral broad fascia, broken near the anterior margin, two rounded spots near the base, and two smaller ones on the anterior branches of the cruciform elevation at the base : abdomen pale castaneous, disc piceous, gradually widening from the base to the apex, where it is wholly black. Underside of the body ochraceous and unspotted; a black spot on the inner margin of the eyes, anterior tibiæ and tarsi, apices of intermediate tibiæ and tarsi, and apex of the rostrum, piceous. Opercula pale greenish: tegmina and wings pale hyaline, transverse veins at the bases of the second and third apical areas, infuscated. Face broadly sulcated in the centre, and transversely striated (many of the striæ black) ; rostrum passing the posterior coxæ, and reaching the inner angles of the opercula. Opercula reaching the second abdominal segment, the outer margins subparallel with the lateral abdominal margins, hipped and widest (but not meeting) near the bases of the femora, from thence diverging and gradually narrowing to the apex, which is obtusely angulated : anterior femora with two long and prominent teeth, and a shorter one near the apex. Posterior tibiæ with three inner and two outer long marginal spines (*Distant*).

48. COSMOPSALTRIA OOPAGA, Distant.

J. A. S. B. liii, (2), p. 227, no. 58.

Head dull ochraceous : posterior lateral margins of the frons black ; the two basal ocelli surrounded with black, which extends to the posterior margin : pro- and mesonotum pale olivaceous ; pronotum with a central longitudinal ochraceous fascia, bordered with black, which is widest anteriorly, and rounded, with the black lines continuous posteriorly ; mesonotum with two obconical spots, bordered with black on the anterior margin, followed by a small black spot, and an anterior lateral fascia ; a curved basal fascia and a small spot on each frontal side of the cruciform elevation, of the same colour : abdomen dull ochraceous, inclining to olivaceous, with the lateral side sparingly covered with greyish pubescence, and with an indistinct lateral segmental row of fuscous spots. Underside of the body, pale ochraceous or olivaceous: tegmina and wings pale hyaline : the body is broad and somewhat depressed, the abdomen narrowing at the apex : the head, including the eyes, is narrower than the base of the pronotum, and but little wider than the mesonotum : the rostrum about reaches the apex of the first abdominal segment : the opercula, which almost reach the apex of the fourth abdominal segment, are situate on the lateral side of the abdomen, much wider apart at the base than at the apex ; they are concavely narrowed on each side near the base, and are there widened and convex on each side to the apex, which is broad and rounded ; the extreme apex beng on the outer margin. The face is tumid with a curved black fascia at the base, and a central longitudinal furrow ; it is profoundly transversely striated, the interstices being very broad (*Distant*).

49. COSMOPSALTRIA FLAVIDA, Guérin.

J. A. S. B. liii, (2), p. 227, no. 60.

Yellow-virescent : head yellowish-green with a brown spot on each side of the labrum and in front and another blackish spot in the middle between the eyes which are red : the pronotum is broader behind, of the same colour as the head, with a transverse groove rounded at the ends and two oblique grooves in front ; the posterior margin after the groove is flat, wrinkled transversely, bordered brown, also two triangular spots placed in its midst and two lines on the anterior margin but not reaching the middle : mesonotum tumid, smooth, with two deep hollows on the posterior and lateral margins, emarginate behind ; above and at its junction with the pronotum are four angular brown spots, a longitudinal line and two arcuate spots on the dorsum and four rounded spots behind, brown : abdomen yellowish-green, the middle slightly red and the posterior margin of the segments finely edged with black, covered with a silvery white pubescence. Tegmina and wings transparent, veins yellow and in some places, brown ; a row of seven small round brown spots on the external margin of the tegmina (and four on the anastomoses) larger and deeper posteriorly : body beneath more yellowish than above with portions greenish : tip of rostrum black, reaching the posterior coxæ : opercula small, bordered outside with black : femora yellow (anterior pair excepted which have beneath two small spines and the tips, black) ; tibiæ yellow with base and tip blackish ; tarsi brown : oviduct ♀ orange yellow *(Guérin)*.

50. LEPTOPSALTRIA GUTTULARIS, Walker.

J. A. S. B. liii, (2), p. 227, no. 61.

♀ Testaceous varied with green, beneath mostly pale green : head with a 4-forked mark about the ocelli, two transverse streaks on each side, sutures on the face and three streaks on each side, black : a band in front on the pronotum also two stripes which approximate in the middle and three streaks on each side where there is an acute angle in front, a median stripe and five streaks on each side on the mesonotum, four spots on the pectus, and abdomen partly beneath towards the tip, black : tegmina and wings vitreous, veins testaceous, black towards the tips ; tegmina with a whitish stigma, tips and transverse veins and tips of the marginal veins clouded with brown.

51. LEPTOPSALTRIA ALBIGUTTA, Walker.

Dundubia albigutta, Walker, J. Linn. S. Zool. i, p. 83 (1856).

Green, partly testaceous : two lines forming an angle, in front of the ocelli, borders of ocelli, a line on each side of the fore margin of the head, transverse lines along most of the ridges on each side of the frons, and two tubercles on each side of the abdomen beneath, black : opercula small rounded : tegmina and wings vitreous ; the former slightly clouded brown at the tips ; a whitish spot on the costa at the tip of the first apical area ; first and second transverse veins with brown spots (*Walker*). Body long, 18—19 ; exp. teg. 67 millims.

Reported from Malacca, Singapore,

52. COSMOPSALTRIA ANDERSONI, Distant.

Cosmopsaltria andersoni, A. M. N. H. (5 ser.) p. 170 (1883).

♂. Head olivaceous ; lateral margins of the frons, area of the ocelli and a small spot on each side of the same, black : pro- and mesonotum olivaceous, the former with a central, longitudinal, ochraceous band, bordered with black, widest anteriorly and compressed about the centre and with a small curved black line behind the eyes : mesonotum with two obconical spots bordered with black on the anterior margin, on each side of which is a small discal black streak and a curved black spot on each side of the base near the anterior angles of the cruciform elevation, which are also black : abdomen dull, dark ochraceous : underside of body pale ochraceous ; annulation on the anterior femora near their apices, upper surfaces and apices of anterior tibiæ, bases and apices of intermediate and posterior tibiæ and tarsi, apex of rostrum, and apical portion of last abdominal segment, black : tegmina and wings pale hyaline, the first with the costal membrane and the basal portion of the venation, ochraceous ; the remaining portion of the venation more or less shaded and marked with the veins black or olivaceous, and with a black claval streak : wings with the veins black or olivaceous, outer claval margin and an inner claval streak fuscous. The body is broad and somewhat depressed, the abdomen above moderately pilose: the head, including the outer margins of the eyes, is subequal in width or a very little narrower than the base of the pronotum: the rostrum about reaches the middle of the first abdominal segment: the opercula are long, strongly compressed and sinuate near the base, and then widened and convex on each side, but narrowing at their apices which reach the base of the last abdominal segment: face swollen and tumid with a narrow median longitudinal groove and strong transverse striations, the interstices of which are very broad. Allied to *C. oopaga*, Distant, from which its smaller size and the greater length of the opercula at once distinguish it (*Distant*). Long, 32; exp. teg. 88 millims.

Reported from Mergui.

Genus POMPONIA, Stål.

J. A. S. B. liii, (2), p. 228.

Stål distinguishes the subgenera *Pomponia* and *Oncotympana* thus :-

Pomponia—Abdomen in ♂ longer than the head, thorax and scutellum taken together, the first segment occupying the fifth or sixth part of the abdomen, posterior margin straight or somewhat rounded, the anterior lateral lobes moderate, not or very slightly convex, covering only a part of the tympana, space between these lobes broad or somewhat so: last ventral segment acutely dentate on both sides at the apex. (*P. fusca*, Olivier).

Oncotympana Abdomen in ♂ short, shorter or only as long as the head, thorax and scutellum taken together; first dorsal segment occupying about one-third of the abdomen, posterior margin more or less distinctly sinuated; anterior lateral lobes very large, covering the entire tympana, convex, broader than the space lying between them: last dorsal segment in ♂ obtusely rounded on both sides at the apex (*P. pallidiventris*, Stål).

53. POMPONIA URANIA, Walker.

J. A. S. B. liii, (2), 228, no. 62.

♂ Body somewhat fusiform, ferruginous, partly whitish pubescent: head and pronotum tinged with green: rostrum tawny, tip black, reaching beyond the posterior margins of the opercula: antennæ tawny: posterior lobe of the pronotum bright green, partly ferruginous along the fore border no tooth: mesonotum green on each side and at the tip, cross-ridge pale tawny: abdomen green, powdered white beneath, and at the base a short snow white band which forms two triangles: drums pale tawny, close; opercula of moderate size slightly overlapping, full one-fourth of the length of the abdomen: legs tawny, tinged green; first femora with three tawny teeth, two large, one very small, claws black, tawny at the base: tegmina colourless, slightly tinged with tawny towards the tips, a row of pale brown spots along the tips of the longitudinal veins of the apical areas; first and second transverse veins clouded brown with traces of it on the others; costal margin green to the stigma, dark tawny thence to the tip; veins green, with black bands across the breadth beneath the brand, wholly black towards the tips: basal cellule, flaps at the base and for a space along the hind border, tawny.

54. POMPONIA BINDUSARA, Distant.

J. A. S. B. liii, (2), p. 228, no. 63.

♂ Body above pale ochraceous; head with the lateral margins of the front bordered with black striæ, and with two contiguous black spots on the disc; two oblique striæ on the lateral margins of the vertex and the area of the ocelli black: pronotum with two central longitudinal fasciæ, narrowed, joined and rounded on the posterior margin, widely divergent and terminating on the anterior margin, a small curved fascia on each side of the disc and oblique striæ also, black: mesonotum with a central fascia, a shorter and more oblique one on each side, followed by an elongate spot on the anterior margin, and a long, somewhat broken, submarginal fascia, black; two rounded spots in front of the cruciform elevation, and two smaller ones on the anterior branches of the same, also black: abdomen somewhat thickly covered with pale pubescence, with a series of discal segmental markings, two large spots near the lateral margins of the third and fourth segments, and a lateral segmental row of small spots, black. Underside of the body pale ochraceous: apical disc of the abdomen, black: tegmina and wings pale hyaline; transverse veins, at the bases of the second and third apical areas, slightly infuscate: face convex: apical two-thirds with a narrow central furrow transversely striated, the striæ black near the middle. Rostrum slightly passing the posterior coxæ, its apex black: opercula small, posterior margins obtusely angulated, and reaching the base of the first abdominal segment, widened and obtusely angulated, but not meeting inwardly: posterior tibiæ with three inner and two outer marginal spines: anterior femora with two long and prominent spines (*Distant*).

55. POMPONIA KAMA, Distant.

J. A. S. B. liii, (2), p. 228, No. 65.

♀ Head, pronotum and mesonotum greenish: head with the lateral sides of the frons, black: vertex with two transverse lines on the lateral margins, somewhat connected inwardly by a short oblique fascia and the area of the ocelli, from which proceed two narrow fasciæ to the posterior margin, black: pronotum with a median, black, clavate fascia, of which the middle is ochraceous, widest and much angulated at the anterior margin, narrowest and somewhat acutely pointed on the posterior margin; an arcuated narrow fascia on each side of the disc; oblique striæ pale fuscous; lateral submarginal striæ black, and an oblique fuscous spot on the lateral margins; posterior margin narrowly edged with black: mesonotum with two large obconical spots margined with black, and a large Λ fascia in front of the anterior angles of the basal cruciform elevation: tympana pale greenish, fuscous anteriorly, and bright cretaceous-white near the lateral margins: abdomen castaneous, lateral margins of the basal segment bright cretaceous-white. Body beneath with the head, sternum, and opercula greenish; abdomen castaneous: legs greenish; apices of tibiæ and tarsi and tarsal claws, black: tegmina pale fuscous hyaline; anatomoses and apices of the lateral veins at the margin broadly infuscate, and a blackish spot near the termination of the radial, vein: wings pale hyaline: face broad, convex, the middle blackish, and with a central longitudinal impression, and transverse striations: rostrum with the apex black, and just passing the posterior coxæ: opercula very short, not reaching the base of the first abdominal segment: abdomen beneath deeply furrowed at the lateral margins, the disc somewhat gibbous: head, including the eyes, narrower than the base of the pronotum, about equal to the base of the mesonotum (*Distant*).

56. POMPONIA MADHAVA, Distant.

J. A. S. B. liii, (2), p. 229, no. 66.

♂ Body pale greenish: abdomen with a lateral row of three large, oblong, spots, only denoted by their darker green margins, occupying the lateral sides of the first three segments; segmental incisures narrowly dark greenish: ocelli red; eyes fuscous: mesonotum with two very faint obconical spots. Body beneath pale greenish: legs and rostrum pale ochraceous: tegmina and wings pale hyaline; the first with the costal membrane and the veins pale greenish: the head, including the eyes, is narrower than the base of the pronotum; the face is broad and convex, with a broad central longitudinal impression and strong transverse striations; the opercula are small, not reaching the apex of the metasternum; the second and third abdominal segments beneath are rounded, produced, and pointed anteriorly; the rostrum reaches the posterior coxæ (*Distant*).

57. POMPONIA LINEARIS, Walker.

J. A. S. B. liii, (2), p. 228, no. 64.

♂. Body tawny beneath: head and pronotum piceous, with indistinct tawny marks, chiefly along the sutures; face piceous towards the rostrum, which is tawny with a black tip that extends to the posterior margins of the opercula: antennæ black: pronotum with six pale tawny stripes which proceed from the fore border to the disc: pectus green: abdomen ferruginous, segmental incisures black: the tympana dark ferruginous; opercula green, rather large, hardly apart: legs tawny; fore femora with two sharp tawny teeth; tips of feet and of the claws black: tegmina with an indistinct tawny tinge, slightly coloured with green, pale brown and marked with black at the base, costal margin greenish, transverse veins clouded brown; a row of small brown spots on the tips of the longitudinal veins of the apical areas; veins with alternate black and pale yellow bands; veins of the wings tawny, transverse veins darker; flaps pale brown at the base.

58. POMPONIA IMPERATORIA, Westwood.

J. A. S. B. liii, 2) 229, no. 67.

Luteous-fulvous: head and dorsum of thorax with very many black spots varying in size and form; mesonotum with a trifid mark: sides of pronotum emarginate and angulate in the middle: abdomen brunneous, sides paler, a spot on both sides on each segment, black: wings yellowish hyaline, veins fulvous: subapical transverse veins on the tegmina, clouded fuscous, and seven spots towards the margin, fuscous (*Westw.*)

59. POMPONIA TIGROIDES, Walker.

Dundubia tigroides, Walker, Ins. Saund. p. 5 (1858).

Pomponia tigroides, Distant, J. A. S. B. xlviii, (2), p. 38 (1879); liii, (2), p. 229 (1884), no. 69.

♀. Green, partly testaceous: head with minute black marks in front and on each side and with a large black spot on the vertex: pronotum with six black stripes; the inner pair dilated at each end, the middle pair oblique, the third pair marginal; a curved brown discal streak on each side between the first and second pairs: mesonotum with five black stripes which are slightly dilated posteriorly, outer pair curved posteriorly, two black dots on the posterior margin: abdomen with a black lanceolate mark on each of the first and second segments, with black dots along each side and with a black subapical band: costa of tegmina green, luteous beyond the middle, stigma black with a pale band, veins green, partly black, first and second transverse veins very slightly clouded with brown (*Walker*). Body long, 23 ; teg. 54 millims.

Differs from *D. tigrina*, Walker, by the outward curve of the exterior stripes on the mesonotum, by the spots and band of the abdomen and by the first transverse vein of the tegmina, which is slightly oblique outwards, whereas that of *D. tigrina* is very oblique inwards.

Reported from India, Tenasserim.

60. POMPONIA EXPANSA, Walker.

Carineta expansa, Walker, Ins. Saund. Hom. p. 26 (1858); Signoret, B. S. E. F. (6 sér.) i, p. xli (1881).

Pomponia expansa, Stål, Berlin Ent. Zeitschr. x, p. 171 (1866).

♂. Black, short, pilose, very broad : head with two green spots on the vertex ; frons with a green stripe and with lateral transverse testaceous streaks : pronotum with two angular green stripes in the middle and with a curved stripe on each side ; borders testaceous-green with two black spots on each side : mesonotum with various dorsal testaceous marks ; borders green : abdomen blackish-brown ; dorsal and ventral operculas testaceous, with dusky borders, the latter very broad, about half the length of the abdomen : legs testaceous, striped with black : wings vitreous, veins tawny here and there green, partly bright pale green at the base : tegmina with a pale green stigma, a brown spot near the tip of each marginal vein ; transverse veins clouded with brown, first and second slightly oblique and curved, first parted from the second by a little more than twice its length, the third and fourth nearly straight (*Walker*). Body long, 27 ; teg., 96 millims.

Reported from India, China.

61. EMATHIA ÆGROTA, Stål.

J. A. S. B. liii, (2), p. 229, no. 69.

♂. Very pale olivaceous, sparingly greyish-sericeous : a median streak amplified forwards and posterior limbus of thorax, four triangular spots reaching the base of the scutellum (the median small, the lateral spots large), also the dorsum of the abdomen, subtestaceous : tegmina and wings, vitreous ; veins pale olivaceous-virescent, fuscous towards the apex ; a spot on the two exterior anastomoses and a subapical spot at the exterior margin of the tegmina, fuscous ; the first anastomosis of the wings margined with fuscous, the veinless margin inwards at the anal area and the anal area at the base, fuscous : streaks on the femora and apex of tibiæ fuscescent. In the ♂, the opercula are small, oblique, oblong and the first ventral segment is triangularly elevated between the opercula. The head is scarcely broader than the apex of the thorax; the vertex scarcely more than twice as broad as the eyes; frons prominulous. Ocelli somewhat more distant from each other than from the eyes. Thorax either somewhat amplified forwards or with the sides parallel, abruptly amplified at the base. First pair of femora trispinose (*Stål*).

Genus RUSTIA, Stål.

Hem. Afric. iv, p. 8 (1866).

Head as broad as the anterior lobe of the thorax, anterior margin deeply incised between the frons and the freely prominulous lobes of the vertex, lateral part which bears the semiglobose eyes turning somewhat upwards: rostrum short: ocelli twice as distant from each other as from the eyes; eyes remote from the base of the head: the part of the thorax lying before the transverse impression more than twice as long as the posterior part: tympana entirely visible; anterior margin of the sides of the first dorsal segment of the abdomen neither produced nor sending forwards a lobe; ulnar veins of the tegmina distant at the base; wings with five apical areas: first pair of tibiæ not produced in a spine beyond the insertion of the tarsi (*Stål*).

62. RUSTIA PEDUNCULATA, Stål.

Rustia pedunculata, Stål, Berlin Ent. Zeitschr. x, p. 383 (1866).

♀. Testaceous-flavescent: clypeus, lores, genæ (except the ocular part), ocellar area, six streaks on the thorax (median pair and the intramarginal lateral pair narrow), five streaks on the scutellum (the median streak and lateral pair elongate), black-fuscous: the dorsum of the abdomen with obsolete fuscous streaks: tegmina and wings vitreous, veins fuscous, costa and the radial vein yellow-olivaceous, interrupted subapical band (which is dentated posteriorly) on the tegmina, fuscous: last dorsal segment of the abdomen, fuscous; an obsolete median streak and the sides, testaceous-flavescent, the sides with a fuscous spot: last ventral segment very slightly and very broadly sinuated at the apex. Vertex thrice as broad as the eyes: ocelli twice as distant from the eyes as from each other: lateral margins of the thorax parallel, abruptly amplified at the base: interior ulnar area of the tegmina slightly narrowed towards the apex, first apical area longer than the second, seventh and eighth apical areas of equal length, somewhat small: first femora 3-spinose, the subapical spine minute (*Stål*). Long, 13; exp. teg. 31 millims.

Reported from Cambodia.

Genus CICADA, Linnæus, Stål.

J. A. S. B. liii, (2), p. 229.

This is one of the oldest names in the order and has suffered so many changes by the creation of new genera that it would be unprofitable to trace back its history. Taking the changes of the last quarter of a century, we find that in 1866 Stål added *Leptopsaltria*, *Cosmopsaltria*, and *Pomponia* to the *Dundubia* group. The *Cicada* group including *Fidicina* was increased in 1861 (A. S. E. F. (4 sér.) i, p. 613) by *Psaltoda*, *Cryptotympana*, *Tympanoterpes*, and *Selymbria*, and, in 1864, by *Proarna*. In 1862, Stål (Rio. Jan. Hem. p. 19) distributed the species of *Cicada* proper amongst the subgenera *Cicada*, *Taphura*, *Parnisa*, *Calyria*, and *Prunasis*. All of these were raised to the rank of genera in 1866 (Hem. Afric. iv, p. 8) and, excepting *Cicada*, were thrown into the *Tibicen* group. To the *Cicada* group were added *Henicopsaltria*, *Nosola*, and *Emathia*, in 1866; and to the *Tibicen* group, *Henicotettix* in 1858; *Pydna*, *Stagira*, *Callipsaltria*, and *Tympanistria*, in 1861; and *Rustia* and *Bæturia*, in 1866. In 1870, Stål still further divided the species of his restricted *Cicada* in establishing the subgenera *Chremistica*, *Macrotristia*, *Cicada*, and *Diceroprocta*. I doubt much whether any of those Indian species which still bear the generic name *Cicada* really belong to that genus: if they do, they belong to the subgenus *Cicada*, which has the sides of the thorax anteriorly without a lobe; the sides of the last dorsal segment in ♂ posteriorly unarmed, very often produced in an acute tooth in the middle; the sixth ventral segment in ♀ broadly, angularly sinuated at the apex; and the interior ulnar vein straight or but slightly curved. This question can only be settled by an examination of the types.

63. CICADA (?) FERRUGINEA, Olivier.

J. A. S. B. liii, (2), p. 230, No. 74.

Entirely ferruginous, clouded brown: tegmina and wings of a deep colour, the posterior margins light and transparent *(Olivier)*.

64. TIBICEN (?) AURATUS, Walker.

J. A. S. B. liii, (2), p. 230, no. 72.

♂. Body black, densely tawny pubescent, pale tawny beneath: a band in front of the head, three spots in the ocellar area, face and rostrum, tawny: disc of face, tip of rostrum which reaches the intermediate coxæ and the antennæ, black: anterior lobe of pronotum with the borders and a short stripe, behind which are two triangular spots resting on the hind border; posterior lobe and two stripes on the mesonotum amplified in the middle and its posterior margin, tawny: abdomen velvety black with patches of golden hairs: [tympana uncovered, tawny, rather large; opercula pale tawny, small, wide apart ?]: tip of abdomen tawny, with a horn of the same colour: legs yellow; femora striated black; tips of the tibiæ and of the feet, black; claws black, tawny at the base; fore-femora with three robust black teeth; fore-tibiæ mostly black: tegmina colourless, pale buff and marked with buff at the base; costal margin bright rosy red, darker towards the tips, black on the stigma; veins tawny, black towards the tips; first and second transverse veins and the longitudinal vein between them, clouded black: veins of the wings pale tawny with black tips and the tips of the flaps clouded brown. In the ♀ the abdomen is a little longer and more pointed than in the ♂.

Species of doubtful position.

Cicada rugipennis, Walker, Ins. Saund., p. 17 (1858).

♂. Luteous-testaceous, stout: pronotum much broader behind than in front, sides straight, sutures strongly marked: abdomen with a blackish band on the fore border of each segment: wings white, rather broad, very stout and rugulose: tegmina slightly rounded in front, costa and veins reddish, the latter black at the tips; 1-3 transverse veins and most part of the intermediate veins, clouded black: wings with a short angular band in front at two-thirds of the length. Body long, 29½; teg. 84 millims.

Reported from India.

Cicada delineata, Walker, Ins. Saund., p. 17 (1858).

♀. Black, testaceous beneath: ocellar space and two irregular stripes on the head, the frons, margin of pronotum, six irregular stripes on the mesonotum and a spot and dot on each side in front between the intermediate and exterior pair of stripes, a band on the posterior margin of each abdominal segment and the abdomen for the most part beneath, legs, and veins on the tegmina towards the base, testaceous: transverse streaks on the frons, six various stripes on the pronotum and the sutures in part, also three spots on each side, stripes on the femora and tibiæ and veins of the tegmina above the base, black: tegmina and wings vitreous. Body long, 21; teg., 63 millims.

Reported from India.

Cicada subvenosa, Walker, Ins. Saund., p. 18 (1858).

♂. Pale testaceous: greatest part of the vertex, 2-4 stripes on the pronotum, also a dilated spot by the border, four stripes on the mesonotum of which the middle pair are short and two dots behind these and a spot at the base of the abdomen, black: pronotum a little broader than the head with a brown spot on each side hindward; the outer pair of black spots on the mesonotum contain between them some forked testaceous lines: tegmina and wings vitreous, veins pale testaceous, the first and second veins of the tegmina slightly clouded brown. Body long, 14½; teg. 38 millims.

Reported from India.

Cicada strigosa, Walker, Ins. Saund., p. 19 (1858).

♂, ♀. Black: transverse lines on each side of the face, a stripe on the pronotum, the abdomen beneath more or less, greatest part of the femora, a band near the base on the tibiæ, testaceous: tegmina and wings vitreous, with a very oblique interrupted brown band which extends along the transverse veins; veins testaceous, black towards the tips: the basal area and the base of the sixth ulnar area, clouded brown and with a short brown band which extends across the tip of the front area; a brown mark at the tip of the first apical area: abdomen in ♂ with three stout spines at the tip. Body long, 14½; teg., 38 millims.

Reported from India.

Cicada virguncula, Walker, J. Linn. S. Zool. i, p. 84 (1856).

Green: head small: drums very small: abdomen luteous above at the base, hind borders of the segments, luteous: wings vitreous; costa and veins green. Body long, 13½; teg. 35—36 millims.

Reported from Singapore, Malacca.

Genus CICADATRA, Amyot.

A. S. E. F. (2 sér.) v, p. 152 (1847): Fieber, Rev. Mag. Zool. (3 sér.) ii, p. 338, t. 3, (1875).

In A. S. E. F. (4 sér.) i, p. 617 (1861), Stål unites *Tettigia* and *Cicadatra* and makes them subgenera of the united genus. Fieber (l. c.) keeps them separate and describes *Cicadatra* as having the anterior femora trispinose: pronotum trapezoidal: covering of the drums semi-oval or broadly triangular, concealing more or less the drums, and moreover a subulate projection or point: the genital sheath (*porte-pénis*) in the ♂ is corneous, elongate or linear and has at the tip a bundle of ribbon-shaped white or brownish appendages with numerous points: the two sectors spring each from one of the angles of the short basal cellule of the tegmina, the angles separated by a short, oblique, vein: rostrum reaching only the middle or the usually convex end of the mesosternum. In *Tettigia*, the anterior femora are bispinose: pronotum trapezoidally broadened backwards: the drums almost covered by a broad semioval plate: the genital sheath in ♂ is corneous and ends in two horns, incurved towards the base : the two sectors spring from the elongated basal cellule at a right angle, the exterior sector rising at the internal inferior angle, the other a little higher at the tip of the short, oblique, intermediate vein : the rostrum long, reaching the first ventral segment, basal joint prominulous, third joint about $3\frac{1}{2}$ times longer than the second, clypeus long, triangular, acute, four-fifths of the length of the frons : space between the scrobe and the eye almost twice as large as the scrobe : mesosternum broadly triangular, convex with a short and weak apical groove : metasternum in the ♂, obtuse, quadrangular, free.

65. CICADATRA STRIATA, Walker.

J. A. S. B. liii, (2), 229 no. 71 : liv, (2), 116.

♀. Body tawny : head with a broad, slightly interrupted black band ; face convex, with a row of black bands on each side : rostrum tawny, piceous towards the tip, reaching the hind coxæ : pronotum partly black above, with a short, broad, yellow stripe in the middle : mesonotum mostly occupied by four very broad black stripes, the lateral much longer than the median pair and with two tawny streaks : abdomen mostly piceous above : legs tawny : first femora with three rather long teeth : tegmina and wings colourless, veins tawny, black towards the tips ; the first and second transverse veins clouded with brown : fore-flaps tawny, tips of hind-flaps, brown. Body long, $16\frac{3}{4}$: exp. teg. 44 millims.

66. CICADATRA XANTES, Walker.

J. A. S. B. liii, (2), p. 230, no. 75 ; liv, (2), p. 117.

♂. Body tawny : vertex with two very large black spots ; face red above with a piceous stripe in front : rostrum tawny, tip black, reaching the intermediate coxæ : antennæ tawny, piceous at the bases and tips : pronotum with a yellow stripe on each side of which there is a short, slightly curved stripe and a small spot on the hind border, piceous : mesonotum with four black obconical stripes, the middle pair rather less than half the length of the outer pair and so close together that they almost appear united ; behind them are two piceous spots which join the cross-ridge which is ferruginous and small : abdomen ferruginous with a piceous stripe which tapers from the base to a little beyond the middle and then disappears : drum-covers pale tawny, very small, not half covering the tympana which are ferruginous ; the opercula bright tawny, rather narrow, of moderate size, about one-third the length of the abdomen : legs tawny ; femora striated ferruginous ; tips of claws black fore tibiæ and feet ferruginous ; fore femora with two rather long ferruginous teeth : tegmina colourless, veins yellow, on the costal margin a black vein is enclosed between two yellow veins and extends to the pale yellow stigma : flaps with a tawny tinge at the base and along part of the middle vein.

67. CICADATRA QUADRIMACULA, Walker.

J. A. S. B. liii, (2), p. 233, no. 93 ; liv, (2), p. 117.

♂. Body bright tawny, scarcely pubescent : head, rostrum (base excepted), antennæ, black : pronotum with a slightly curved stripe on each side, two triangular spots on fore border, three small spots on hind border, and some indistinct marks on the disc, black : mesonotum with four very large black spots of which the outer pair are obconical, slightly oblique, widened to each other at the base, on the inner side slightly emarginate by a very slender short oblique tawny stripe, the third spot much shorter and apparently divided into two U-shaped spots, the fourth behind the third, quadrate, with a slender cone on its fore border : a large spot on each side at the base of the antennæ, a small one in front of the head and three along the hind border, and the base of the rostrum, tawny : abdomen black above, posterior dorsal margins of the segments with an interurrupted reddish band, a broad pale tawny band near the tip, horn pale tawny ; beneath piceous, posterior margins of the ventral segments, ferruginous, tip pale tawny : drum-covers very small, pale tawny, with blackish discs partly covering the tympana, which are greyish ; opercula bright tawny, small, far apart : legs tawny : coxæ, posterior femora and last tibiæ striped black ; claws ferruginous ; first femora black with a tawny spot near the tip and with three robust black teeth ; first tibiæ black with a slender tawny band near the base, middle pair black ; first and middle feet, piceous ferruginous at the base, last pair tawny with piceous tips : tegmina whitish, pale tawny and marked with black at the base, costal margin bright tawny, stigma pale brown, veins pale tawny, black towards the tips first and second transverse veins and the space between them and the costal margin clouded very dark brown ; fore-flaps pale tawny : wings with the first and second transverse veins and the space between them clouded very dark brown, flaps white at the base and along some part of the hind border.

Genus CRYPTOTYMPANA, Stål.

J. A. S. B. liii, (2), p. 230.

Head very broad, about as broad as the thorax ; frons occupying about a third part of the breadth of the face : thorax very slightly amplified backwards from the apex; the lateral margins dilated, straight, or slightly sinuated; anterior angles distinct; posterior limbus broad: scutellum posteriorly depressed, slightly sinuate at the apex: tegmina with eight apical areas, basal cell sending out two veins which are rather broadly distant: wings with six apical areas; abdomen obconical, tympana entirely hidden above by the very large lobe of the dorsal segment which is produced forwards: opercula large, flattish, contiguous inwards or slightly valvate: metasternum furnished with a stout process which is curvedly produced from the base backwards: first pair of femora beneath with two large spines and near the apex with an obsolete, obtuse, small tooth (*Stål.*)

68. CRYPTOTYMPANA RECTA, Walker.

J. A. S. B. liii, (2), p. 230, no. 77.

♀. Body black, short, broad, tawny pubescent in parts: rostrum black, tawny at the base, reaching the last coxæ: antennæ black: posterior lobe of the pronotum with two large tawny spots; the mesonotum with two small tawny spots near the middle of its posterior margin: opercula tawny, very small, wide apart: legs dark tawny; femora, especially the first and intermediate pairs, striped black; tips of the tibiæ, feet, and fore-tibiæ, black; first femora with three black teeth of which two are long and one is very small: tegmina colourless, green along the costal margin for half its length, dark brown thence to the tips, black towards the base, to this colour succeeds a small space having an opaline lustre; veins tawny, black towards the tips; the first and second transverse veins and the adjoining longitudinal veins are clouded dark brown; flaps black towards the base.

69. CRYPTOTYMPANA VICINA, Signoret.

J. A. S. B. liii (2), p. 230, no. 78: includes *Fidicina bicolor*, Walker, List Hom. B. M. iv, p. 1121 (1858), from Java.

Much smaller than *C. acuta*, Signoret, from which it differs only in the absence of patches on the pronotum and in the complete transparency of the wings in the external portion: the opercula are proportionately less elongate, but of the same form (♂).

70. CRYPTOTYMPANA IMMACULATA, Olivier.

J. A. S. B. liii, (2), p. 231, no. 79.

Black: wings, hyaline, spotless: abdomen black: opercula reddish: two spines on the first pair of femora, acute, larger than usual (*Olivier*). Head and thorax blackish brown, abdomen black; three red ocelli on the head : opercula orange red : first pair of femora with two robust spines : tegmina and wings hyaline, immaculate, margin of the brown colour of the body beneath. Differs from *C. intermedia*, Signoret, in having the tegmina and wings entirely transparent, the opercula smaller though of the same colour, and the femoral spines apparently more robust. Body long, 50 : exp. teg. 112 millims.

71. CRYPTOTYMPANA INTERMEDIA, Signoret.

J. A. S. B. liii (2), p. 231, no. 80.

Differs from *C. atrata*, Fabr., in the absence of patches on the pronotum and scutellum, whilst those on the head are larger : the brown basal patch on the tegmina is not so large and does not extend beyond the basal cell : opercula are altogether yellow and are larger, elongate, flattened, and with a rim : abdomen reddish yellow with a blackish band on each segment ; sides brown. From Tenasserim (*Walker*) ; China (*Signoret*, B. S. E. F. (6 sér.) i, p. xli, 1881) ; Java (*Sign.*).

72. CRYPTOTYMPANA ATRATA, Fabricius.

Tettigonia atrata, Fabr., Syst. Ent. p. 681 (1775) ; Spec. Ins. ii, p. 321 (1781) ; Mant. Ins. ii, p. 267 (1787) ; Ent. Syst. iv, p. 24 (1794) ; Syst. Rhyng. p. 42 (1803).

Tettigonia pustulata, Fabr., Ent. Syst. iv, p. 20 (1794) ; Syst. Rhyng., p. 37 (1803).

Cicada nigra, Olivier, Enc. Méth. v, p. 750, t. iii, f. 5 (1790) : Stoll, Cig., p. 84 ; t. 22, f., 118 (1788), La Cigale Chinoise noire.

Cicada atrata, Germar, Thon's Archiv. ii (2), p. 55 (1830) ; Silb., Rev. Ent. ii, p. 68 (1834).

Cicada atra, Signoret, Rev. Mag. Zool., p. 406, t. 10, f. 1.

Fidicina atrata, Walker, pt., List Hom. B. M. p. 89 (1850).

Cryptotympana nigra, Stål, Hem. Fabr. ii, p. 6 (1868) ; Ofvers. K. V.-A. Förh., p. 714 (1870).

Cryptotympana atrata, Stål, A. S. E. F. (4 sér.) i, p. 613 (1861).

Entirely dull black ; the margin of the abdomen, especially of the last segment, testaceous : tegmina and wings whitish, black at the base, veins testaceous (*Fabr.*). This description is copied through all Fabricius' works and the reason for Stål giving in his later writings precedence to Olivier's name is not understood.

Black, varied with reddish yellow ; tegmina and wings hyaline varied with brown : head with a reddish longitudinal patch in the middle of the frons, ending below near the eyes and another transverse patch ; pronotum with a patch on each side on the posterior margin, 2-4 on the scutellum, one at each angle : tegmina and wings with a broad opaque, basal, brownish patch occupying the basal cell of the tegmina, which are in the opaque portion veined yellowish, and also in a part of the transparent portion, but becoming obscure and black towards the apical anastomoses: abdomen black, margined yellow: opercula moderate, tumid, rounded, blackish-brown bordered with yellow: feet black, varied with yellow. Long. 47: exp. teg. 134 millims.

Reported from China, Java, but likely to be found in India.

73. CRYPTOTYMPANA ACUTA, Signoret.

Cicada acuta, Sign., Rev. Mag. Zool. p. 409, t. 10, f. 3, 3 A (1849).
Fidicina acuta, Walker, List Hom. B. M. ii, p. 81 (1850).
Fidicina nivifera, Walker, l. c. p. 80 (1850).
Cryptotympana acuta, Stål, A. S. E. F. (4 sér.) i, p. 613 (1861); Ofvers. K. V.-A. Förh. p. 483 (1862); p. 714 (1870).

Black: two reddish brown patches on the pronotum and a yellow band on the posterior margin: mesonotum with six stripes, of which the two median are small: scutellum reddish: metanotum reddish on each side with two median patches: tegmina and wings brownish at the base, the external cellules and the two first anastomoses only being slightly smoky: abdomen with a large farinose patch on each side of the first three segments, which is only feebly indicated on the fourth, beneath black varied with red: opercula large, elongate, ending in a point and sinuate on the margins, entirely yellow: feet black, varied with yellow. Body long, 42: exp. teg. 130 millims.

Reported from Java, Philippines, likely to be found in India.

74. CRYPTOTYMPANA CORVUS, Walker.

J. A. S. B. liii, (2) p. 231, no. 82: liv (2), p. 117.

♀. Body black, short, broad, adorned here and there with patches of bright tawny down: a tawny spot on the face: rostrum and antennæ, black, the former reaching the hind coxæ: abdomen with a tawny spot on each side of the tip beneath: legs black; femora striped tawny, hind tibiæ tawny, black at the base and at the tips: first femora with two long, black teeth: wings nearly colourless, with a slight pale brown tinge at the tips, very dark brown towards the base, costal margin dark brown, striped with green, veins black, greenish towards the base. Body, long, 36: exp. teg. 113 millims.

75. CRYPTOTYMPANA BUBO, Walker.

J. A. S. B. liii, (2), p. 231, no. 81: liv (2), p. 117.

♂. Body black, short, broad, shining, partly clothed with tawny down which forms patches on the thorax: head with five tawny spots in front, the largest on the vertex; rostrum and antennæ, black: eyes prominulous : the pronotum with two dark tawny spots near the hind border, posterior margin of posterior lobe dark tawny, and the mesonotum on each side with two tawny spots : abdomen obconical, a little longer than the thorax, with a dark tawny stripe along each side beneath : drums black, rather large ; opercula large, black, nearly half the length of the abdomen, irregularly triangular, tawny on the outer sides and at the tips, which are narrow and pointed : legs black ; femora tawny beneath except at the base and tips ; a slender tawny band near the base of each middle tibia ; hind tibiæ tawny, black at the base and at the tips ; a broad tawny band on each hind foot : first femora strongly bidentate : tegmina dark brown for half the length from the base, slightly tinged with brown thence to the tips, adorned at the base of each tegmen with a tawny spot, beyond which is a tawny stripe extending nearly half the length of the fore border ; veins tawny for half the length from the base, black from thence to the tips. ♀ has the abdomen much longer than the thorax. Body long 36—40 ; exp. teg. 117—118 millims.

76. CRYPTOTYMPANA (?) INVARIANS, Walker.

Fidicina invarians, Walker, Ins. Saund. Hom. p. 11 (1858).

♀. Black : wings vitreous, black at the base ; veins reddish, partly black along the costa : tegmina with the first and second transverse veins black, very oblique, first very slightly clouded, the third and fourth undulating (*Walker*). Body long 37½ ; teg., 109 millims.

Reported from India.

77. CRYPTOTYMPANA FACIALIS, Walker.

Cicada facialis, Walker, List Hom. B. M. Suppt. p. 30 (1858).

♂. Black, slightly clothed with pale golden pubescence on the borders of the segments : head with a luteous spot on each side in front between the eyes ; face with a luteous stripe, its lateral margins testaceous : abdomen with 2-3 slight tawny bands in the middle beneath : legs partly tawny, tegmina and wings vitreous, black at the base ; veins tawny, black at the tips, first and second transverse veins slightly clouded with black (*Walker*). Body long 37—38 ; exp. teg. 100—101 millims.

Reported from Siam.

78. CRYPTOTYMPANA FUMIPENNIS, Walker.

Fidicina fumipennis, Walker, List Hom. B. M. Suppt. p. 17 (1858).

♂. Black : a streak on the head on each side before and behind, and an undulating streak on each side of the pronotum, ferruginous :

head here and there tawny pubescent: pronotum with a median stripe and hind border, tawny, the latter edged black: mesonotum with four tawny stripes, inner pair short, outer pair partly ferruginous: abdomen with a broad tawny stripe on each side at the tip: opercula acute, slightly falcate, extending to half the length of the abdomen, broadly tawny along the exterior side: legs partly tawny: tegmina and wings nearly vitreous in the middle, green towards the base, brown about the tips and along the external margin; veins green, black towards the tips; first and second transverse veins on the tegmina clouded dark brown (*Walker*). Body long, 22: exp. teg. 121—122 millims.

Reported from Siam.

Genus TIBICEN, Latreille, Stål.

J. A. S. B. liii, (2), p. 231.

Body oblong: head varying in breadth, rarely broader than the anterior margin of the thorax; frons slightly or moderately convex, occupying not more than half of the breadth of the face, furnished with a longitudinal groove: clypeus subacuminated at the apex or slightly truncated: rostrum short or moderate: ocelli remote from the base of the head: sides of thorax rarely a little dilated, very often convex, amplified posteriorly: costal margin of the tegmina not or towards the base only a little dilated, ulnar veins very often entirely distant, never contiguous; eight apical areas, first apical area extended farther forwards than the second: tympana entirely visible: anterior margin of the posterior part of the first dorsal segment of the abdomen not amplified in a lobe, straight: last ventral segment in ♀ deeply and broadly emarginated: opercula small or moderate, not valvate, rarely contiguous: first pair of femora spinose beneath (*Stål*). In Hem. Afric. iv, p. 26 (1866), Stål distributes the African species of this genus amongst the subgenera, *Abricta*, *Abroma*, *Quintilia*, and *Epora*, to which, in 1870, he added *Nelcynda*. The Indian species *T. brunneus*, Fabr., belongs to the subgenus *Abricta* and *T. apicalis*, Germar, to *Abroma*.

79. TIBICEN AURENGZEBE, Distant.

J. A. S. B. liii, (2), p. 231, no. 83.

♂. Body above dull ochraceous. Head with the front margined anteriorly by two narrow black striæ; ocelli narrowly margined with black; eyes pale ochraceous: pronotum with a central longitudinal sulcation, bordered with a small fuscous spot on each side at the anterior margin, starting from a wide, transverse, and somewhat raised base, on the middle of which is a fuscous spot; oblique striæ narrowly fuscous;

lateral anterior and posterior margins much paler: mesonotum with two short obconical median fuscous spots and a large sublateral and somewhat broken fascia of the same colour on each side: abdomen with the posterior segmental margins narrowly and obscurely paler. Body beneath concolorous; middle of the face, metasternum, disc and apex of the abdomen, fuscous: legs concolorous, femora streaked with fuscous; bases and apices of tibiæ, and apical points of tarsi, also fuscous. Tegmina and wings pale hyaline and talc-like; tegmina with costal and basal half of venation ochraceous, remainder fuscous; transverse veins at the bases of the second and third apical areas infuscated. Width of head, between the outer margins of the eyes, rather less than that of the pronotum at the base; pronotum a little more than twice as broad as long; face with the base much elevated, somewhat narrowing to the apex, distinctly longitudinally sulcated, and strongly transversely striate: rostrum about reaching the posterior coxæ, with the apex pitchy; opercula slender, curved inwardly, but not meeting at the base or apex *(Distant)*. Long. 18: exp. tegm. 48 millims.

80. TIBICEN APICALIS, Germar.

J. A. S. B. liii (2), p. 231 no. 84: liv (2), p. 117.

♀. Head somewhat broader than the base of the thorax, black, frons tumid, basal spot ferruginous: thorax anteriorly much narrower than the head, sides obtuse, slightly converging backwards, posteriorly abruptly amplified, posterior limbus narrow; upper apical segment in ♀ with two black stripes. Very near *T. brunneus*, Fabr., but differs in being smaller, head broader, frons much more tumid, sides of thorax slightly converging backwards, and in the markings. In the form and structure of the tegmina, abdomen, and spine of posterior trochanters, it agrees with *T. brunneus (Stål)*.

81. TIBICEN SUBVITTA, Walker.

J. A. S. B. liii (2), p. 230, nos. 71, 73: liv (2), p. 117.

♂. Body black, scarcely pubescent: a small tawny spot on the vertex between the ocelli and the hind border: rostrum and antennæ black, the former reaching the intermediate coxæ: pronotum with a slender tawny stripe extending from the fore to the hind border: abdomen obconical, piceous, tawny at the tip, beneath ferruginous and tawny towards the tip; [drums large, pale brown and opercula tawny?]: legs black; femora striped red; claws and hind feet tawny; femora with three tawny teeth, of which one is very long and two are of moderate size; hind tibiæ tawny towards the tips: tegmina and wings colourless, whitish and tinged with red at the base, veins pale tawny, black towards the tips: basal cell and adjoining veins clouded brown: tegmina with two oblique dark brown bands, the first interrupted, the second occupying the transverse veins, but not reaching the hind border; a small dark brown spot on the tips of the fore border; a row of pale brown spots occupies the tips of the veins of the apical areas; fore membranes whitish: wings with a broad, interrupted oblique brown band which communicates here and there with the base along the borders of the veins; flaps colourless, brown along the fore border and towards the base, where they are whitish; veins tawny; black towards the tips.

82. TIBICEN PUSILLUS, Fabricius.

Tettigonia pusilla, Fabr., Syst. Rhyng. p. 44 (1803).
Cicada pusilla, Walker, List Hom. B. M. i, p. 229 (1850).

Small: thorax flavescent; the anterior lobe, a pale dorsal line, and small impressed lines, black, the posterior lobe with four dull black spots at the base, the lateral ones largest: abdomen flavescent, segments black at the base: wings hyaline, costa flavescent: feet flavescent (*Fabr.*).

Reported from Amboina, India.

83. TIBICEN (?) NANA, Walker.

Cicada nana, Walker, List Hom. B. M. i, p. 202 (1850).

♂. Body tawny: vertex ferruginous, piceous on each side; face with two piceous stripes in front: rostrum dark tawny, tip black, reaching the intermediate coxæ: antennæ tawny: pronotum ferruginous with a very large triangular black mark on each side: opercula of moderate size, rather less than one-third of the length of the abdomen: legs tawny; claws black; femora with three tawny teeth: tegmina and wings colourless; veins tawny, black along the hind borders of the tegmina. Long, $12\frac{1}{2}$; exp. teg. 29—30 millims.

Reported from China.

Genus MOGANNIA, Amyot & Serville.

J. A. S. B. liii, p. 232.

Body elongate: head small; frons conically produced: eyes small scarcely prominulous: tegmina large and broad, their basal half coriaceous, more or less transparent, up to a transverse elevated line beyond which, and the wings, hyaline; costal margin of the tegmina somewhat straight before the middle, the second apical area extended forwards to a less distance than the first: abdomen stout, inflated, broader than the thorax, a little compressed on its upper surface on both sides, so as to form a kind of ridge (*A. & S., Stål*).

84. MOGANNIA CONICA, Germar.

J. A. S. B. liii, (2), p. 232, nos. 85 *(M. illustrata)*, 86 *(M. recta)*; liv, (2), p. 117: includes also *Cephaloxys hemelytra*, Signoret, A. S. E. F. (2 sér.) v, p. 295; *Mogannia ignifera*, Walker, List Hom. B. M. i, p. 249 (1850), from Java, and *Mogannia avicula*, Walker, l. c. p. 249 (1850), from Java and the Philippines.

♂. Ferruginous: abdomen with a red band on the posterior margin of each segment: tegmina and wings vitreous, red at the base, veins tawny; the tegmina tawny for more than one-third of the length from the base and having a brown upright band dividing the tawny from the vitreous part; the wings brown along the basal part of the hind border (*M. recta*, Walker).

85. MOGANNIA OBLIQUA, Walker.

J. A. S. B. liii, (2), p. 232, no. 87.

♀. Green, mostly reddish beneath: head black along the hind border: pronotum with some testaceous marks and a black stripe dilated backwards: mesonotum with some testaceous marks and a black stripe dilated before and behind: abdomen reddish with a spot on each side near the base and a short band hindward of pale sericeous pile, two green bands near the tip: legs piceous; posterior tibiæ and tarsi pale green: tegmina and wings vitreous, red at the base, veins green black towards the tips; the tegmina have a red costa, a brown band extending from the tip of the front areolet obliquely to the hind border, whence it is continued obliquely towards the base of the wing (*Walker*).

86. MOGANNIA VENUSTISSIMA, Stål.

J. A. S. B. liii, (2), p. 232, no. 88.

♂, ♀. Cærulean or brassy black, sordid flavescent-sericeous: tegmina before the middle and the wings sordid hyaline; the tegmina veined sordid straw-colour, before the middle black, at the base pale sanguineous; the wings veined fuscous, sanguineous at the base.

Var. *a.* Basal spot on frons and oblong median spot on the thorax, sanguineous.

Var. *b.* Entire frons, median streak on the thorax contracted in the middle, also veins and band on the black part of the tegmina, weak sanguineous-flavescent; abdomen varying into ferruginous (*Stål*).

87. MOGANNIA FUNEBRIS, Stål.

J. A. S. B. liii, (2), p. 232, no. 89.

♀. Aenescent-black, fuscous, pilosulous: tegmina and wings vitreous, the former black before the middle, basal area and a band at the apex of the black part, sordid lutescent (*Stål*).

88. MOGANNIA INDICANS, Walker.

J. A. S. B. liii, (2), p. 232, no. 90.

♂. Body bright or very dark red: rostrum black reaching the intermediate coxæ: antennæ yellow, black at the base: a very large dark ferruginous spot on each side of the fore-chest: mesonotum with a broad, obconical, oblique, black stripe on each side, the margins of which are also black: pectus black: abdomen blackish towards the base, tip with a black horn: legs black, pilose: coxæ and posterior femora marked with red: tegmina and wings colourless, tawny at the base; the tegmina with a broad brown band which includes a very irregular yellow band; veins yellow, tawny at the base. ♀. Body nearly all black; a colourless spot on the base of the brown band of the tegmina (*Walker*).

89. MOGANNIA (?) LOCUSTA, Walker.

J. A. S. B. liii, (2), p. 233, no. 91.

♀. Body ferruginous, pale tawny beneath: two small black spots between the ocelli: rostrum pale tawny, tip piceous, reaching the intermediate coxæ: antennæ tawny: anterior lobe of the pronotum with two slender black stripes which slightly converge from the fore border and then slightly diverging include a nearly circular space and are united on the hind border, a small black spot on each side in front; posterior lobe tawny: mesonotum with three slender black stripes, the side pair slightly converging towards the tip of the middle one, sides and hind border tawny, pale yellow sericeous: abdomen pale tawny, with a very broad dorsal ferruginous stripe extending from the base to the narrow part, a row of small piceous spots along each side; last segment piceous above at the base, horn tawny, rather long; sheaths pale tawny, piceous and pilose towards the tips, and extending some distance beyond the tip of the abdomen; oviduct ferruginous, black and serrated at the tip: legs pale tawny; first femora with three tawny teeth, of which one is very small: tegmina colourless, basal cell, costal margin, and veins pale tawny; wings colourless, in both fore membranes pale buff, flaps pale buff at the base and for a space along the hind border.

90. MOGANNIA (?) LACTEIPENNIS, Walker.

J. A. S. B. liii, (2), p. 233, no. 92.

♂. Body luteous, palely pilose : head black, a small tawny spot at the base of each antenna ; a large tawny spot on each side of the face : rostrum black, tawny at the base ; antennæ black : a black band along the fore border of the posterior lobe of the pronotum : mesonotum with four black obconical marks, median pair not more than half the length of the lateral pair, between the former there is a black stripe increasing in breadth from the fore border to the middle where it ceases : abdomen black, posterior dorsal margins of segments tawny, a tawny spot on each side near the tip which is tawny : drums tawny, small, open, furrows hoary ; opercula very small : legs luteous, a piceous spot at the tip of each tibia ; tips of claws, black ; first femora with two stout teeth which are partly black at the base : tegmina and wings white, opaque, luteous at the base ; veins black, tawny towards the base and near the stigma.

91. MOGANNIA HEBES, Walker.

Cephaloxys hebes, Walker, List Hom. B. M. Suppt. p. 38 (1858).

♂. Testaceous : pronotum blackish with a stripe and the border, testaceous ; mesonotum with four blackish obconical stripes, the inner pair very short : two black spots on each of the second and third segments of the abdomen : opercula oblique, elongate-conical : tegmina and wings vitreous, veins pale green, black at the tips. Body long, 16$\frac{3}{4}$: exp. teg. 42 millims.

Reported from N. China.

92. MOGANNIA NASALIS, White.

Mogannia nasalis, White, A. M. N. H. xiv, p. 426 (1844) ; Walker, List Hom. B. M. i, p. 248 (1850).

Head, thorax, and body finely yellowish-brown sericeous, especially above : near the base of the tegmina is a broad transverse band (widest interiorly) of a glossy yellowish hue, darker on the borders, veins greenish, base and tip quite clear : wings with the veins obscure, inner edge reddish : pronotum with two large rounded spots, one on each side ; the margin and a line through each spot, deeply impressed : hind tibiæ hairy behind with three longish spines on the apical half (*White*). Long, 22 millims.

Reported from Hong-kong.

93. MOGANNIA CHINENSIS, Stål.

Mogannia chinensis, Stål, Ofvers. K. V.-A. Förh., p. 155 (1865).

♂. Black, remotely golden-yellow sericeous : a streak and the apical part of the dorsum of the abdomen, densely sericeous : the tegmina and wings vitreous ; veins fuscous ; a broad, oblique, sordid stramineous band on the tegmina before the middle, anteriorly and posteriorly the band often interrupted and with a fuscous end : tibiæ and the posterior tarsi yellow-whitish ; intermediate tibiæ at the base and apex and the last pair at the base, black : venter ferruginous. Very like *M. nasalis*, White, differs in the larger size, the colour of the posterior tibiæ, and in the lateral processes of the upper anal segment in ♂ being longer (*Stål*). Long, 18 ; exp. teg. 40 millims.

Reported from N. China.

94. COSMOSCARTA SIAMENSIS, Butler.

Cosmoscarta siamensis, Butler, Cist. Ent. i, p. 245, t. viii, f. 1 (1874) ; J. A. S. B. iv (2), p. 23 (1885).

Allied to *C. tricolor*, St. Farg., but in the form of the thorax more like *C. divisa*, Walker. Head and thorax, basi-costal third of corium, and basal part of the clavus reddish-testaceous : wings pale fuscous, the basi-costal veins and the base, reddish : abdomen above and beneath blue-black : pectus and legs, piceous ; hind tibiæ with a strong spine. A variety has the basal third of the tegmina reddish-testaceous (*Butler*). Long, 18 ; exp. teg. 42 millims.

Reported from Cambodia.

95. COSMOSCARTA RUGULOSA, Walker.

Cercopis rugulosa, Walker, J. Linn. S. Zool. i, p. 95 (1856), p. 105 (1857).
Cosmoscarta rugulosa, Butler, Cist. Ent. i, p. 249 (1874).

Black, shining ; ferruginous beneath : abdominal margins and the legs red : a blackish band on each femur : tegmina rugulose (*Walker*). Long, 10½ ; teg. 29¼ millims.

Reported from Singapore, Borneo.

96. COSMOSCARTA MALAYA, Stål.

Cercopis malaya, Stål, Ofvers. K. V.-A. Förh., p. 147 (1865).

♂. Black-violaceous, sparingly puberulous, tegmina and feet blackish : two smallish spots on the corium behind the middle, one placed at the costa, the other obliquely behind it, also two very minute obsolete spots of which one is at the apex of the clavus and the other behind the middle of the costal margin, red. Thorax fairly densely and finely punctured, truncated at the base before the scutellum, margins (anterior excepted) reflexed, lateral angles obtusely rounded : scutellum impressed before the middle : tegmina very densely punctulate, scarcely narrowed towards the apex : mesostethium rather distinctly bituberculate, posterior margin not elevated before the coxæ (*Stål*). Long, 8; exp. teg., 23 millims.

Reported from Malacca.

97. COSMOSCARTA HEROS, Fabricius.

Cercopis heros, Fabr., Syst. Rhyng. p. 89 (1803) : Stoll, Cig. p. 104, t. 27, f. 149. (1788) : Stål, Ofvers. K. V.-A. Förh. p. 492 (1862) : Walker, List Hom. B. M. iii, p. 654 (1851).

Cercopis abdominalis, Westwood in Donovan's Ins. China, p. 39, t. 16, f. 5 (1843) : Walker, l. c. p. 654 (1851) : J. Linn. S. Zool. x, p. 286 (1867).

Cosmoscarta heros, Stål, Hem. Fabr. ii, p. 11 (1869) ; Butler, Cist. Ent., i, p. 254 (1874).

♂, ♀. Black, shining : head very obtuse and almost globose : thorax gibbous, dull black, spotless : tegmina dull black, the base and a median band, orange-fulvous : abdomen red (*Fabr.*). Long with teg., 16 ; breadth of thorax, 6⅔ millims.

Reported from Hong-Kong.

98. COSMOSCARTA DISCREPANS, Walker.

Cercopis discrepans, Walker, J. Linn. S. Zool. i, p. 95 (1856).

Blackish-purple, black beneath : tegmina black with an elongated red spot which is contracted in the middle and occasionally interrupted (*Walker*). Long, 6—7½ ; teg. 17—19 millims.

Reported from Singapore.

99. COSMOSCARTA UNIFASCIA, Walker.

Cercopis unifascia, Walker, J. Linn. S. Zool. i, p. 95 (1856).

Red : thorax dilated on each side : disc of the pectus black : tegmina with a black band across the middle : wings hyaline (*Walker*). Long, 12½ ; teg. 25 millims.

Reported from Singapore.

100. COSMOSCARTA FULVICEPS, Dallas.

Cercopis fulviceps, Dallas, Trans. Ent. Soc. (n. s.) i, p. 10 (1850).

Head and thorax bright orange, shining : tegmina reddish black, somewhat obscure, outer margins pitchy red : wings brownish ;

abdomen beneath black, shining; pectus, legs, and rostrum pitchy. Long, 22 millims.

Reported from Sikkim.

101. COSMOSCARTA DIMIDIATA, Dallas.

Cercopis dimidiata, Dallas, Trans. Ent. Soc. (n. s.) i, p. 11 (1850).

♀. Head black; eyes pale brown, ocelli yellowish-white: thorax very thickly and finely punctured, with its posterior half and a transverse quadrangular patch on the anterior margin black; the remainder bright red; scutellum black: tegmina bright red, with three broad irregular black transverse bands, the first of which rises at the apex of the scutellum, the second a little behind the middle, and the third forms a broad black margin around the apex: body beneath black, shining; legs and rostrum pitchy (*Dallas*). Long 15 millims.

Reported from Sikkim.

To the above may be added:—

C. pulchella, Butler, Cist. Ent. i, p. 254 (1874). Laos.
C. exultans, Walker, List Hom. B. M. Suppt. p. 171 (1858). N. China.
C. bimacula, Walker, l. c. iii, p. 656 (1851). China.
C. rotundata, Walker, l. c., Suppt. p. 174 (1858). Laos.
C. pellucida, Butler, Cist. Ent. i, p. 262 (1874). Laos.
C. Distanti, Butler, P. Z. S. p. 672 (1874). Penang.

102. PHYMATOSTETHA PUDICA, Walker.

J. A. S. B. liv (2), p. 15, (1885).

Tawny, black beneath: pronotum with a black mark in front, divided by a testaceous stripe and having on each side of it a testaceous spot; scutellum black with a testaceous stripe abdomen cupreous-black, testaceous at the base and with a row of testaceous spots on each side beneath: legs testaceous, tips of femora, black; tibiæ black with a testaceous band near the tip: tegmina brown with a testaceous undulating basal subcostal streak and with two testaceous bands which have black borders in front; the first band at one-third of the length, composed of three spots, the second band at two-thirds of the length, entire, attenuated before the middle; tips testaceous: wings pale brown, rosy at the base (*Walker*). Body long, 15—16; teg. 35—36 millims.

Reported from Silhat.

To this add the following:—

P. semele, Stål, Ofvers. K. V.-A. Förh. p. 151 (1865). Malacca, Laos.
P. triseriata, Butler, Cist. Ent. i, p. 267 (1874). Laos.
P. dislocata, Walker, J. Linn. S. Zool. i, p. 95 (1856). Malacca.

P. borneensis, Butler, l. c. p. 268 (1874). Malacca, Ligor, Borneo.
P. nympha, Stål, l. c. p. 150 (1865). Malacca.
Colsa costæstriga, Walker, l. c. p. 96, t. iv, f. i (1856). Malacca.

103. PTYELUS (?) INTEGRATUS, Walker.

Ptyelus integratus, Walker, Ins. Saund. Hom. p. 94 (1858).

Dark testaceous : head with a broad stripe beneath, abdomen in the middle, coxæ, streaks on femora and hind tibiæ, blackish : tegmina testaceous slightly darker towards the base ; wings vitreous (*Walker*). Body long, 7¼ ; teg. 16—17 millims.

Reported from India.

To this add the following :—

? *P. bipars*, Walker, J. Linn. S. Zool. i, p. 96 (1856). Singapore.
? *P. immutatus*, Walker, l. c., p. 96 (1856). Singapore.

Add the following to the genus CLOVIA.

C. multilineata, *Ptyelus id.*, Stål, Ofvers. K. V.-A. Förh., p. 154 (1865). N. China.

C. malaya, *Ptyelus id.*, Stål, l. c. p. 153 (1865). Ligor, Malacca, China.

C. punctum, Walker, J. A. S. B. liv (2), p. 115 includes apparently *Ptyelus orientalis*, Stål, Freg. Eug. Resa, Hem., p. 287 (1859).

Add to the genus MACHÆROTA.

M. punctato-nervosa, Signoret, A. S. E. F. (5 sér.) ix, p. xlix (1879). China.

104. MEMBRACIS FUSCATA, Fabricius.

J. A. S. B. liv, (2), p. 79, no. 5.

Thorax foliaceous, rounded, fuscous ; with a slender streak before the anterior margin and a broader band before the apex, white : apex acute, black : tegmina fuscous (*Fabr.*).

105. LEPTOBELUS SCUTELLARIS, Fabricius.

J. A. S. B. liv, (2), p. 83, no. 12.

Head black : thorax with two, flat, robust, acute horns, produced posteriorly, subulate, entirely black with a broad snow-white, posterior band : wings deflexed, fuscous : costa a little white at the base : body fuscous (*Fabr.*).

106. CENTROTYPUS ONERATUS, Walker.

Centrotus oneratus, Walker, Ins. Saund. Hom. p. 78 (1858).

Tawny : pronotum pubescent, moderately high, minutely punctured ; lateral horns lanceolate, very broad, rather flat, directly diverging, obliquely ascending, with a slight ridge, near the hind side of each; posterior horn ridged, straight, very slender, acute at the tip, extending a little beyond the abdomen: abdomen greyish ferruginous with black points, except along the hind borders of the segments: legs tawny: tegmina tinged slightly testaceous, veins testaceous; wings vitreous, veins black (*Walker*). Body long $4\frac{1}{4}$; teg. $10\frac{1}{2}$ millims.

Reported from India.

To this add:—

Centrotypus longicornis, Vuillefroy, A. S. E. F. (4 sér.) iv, p. 142, t. 1, f. 8 (1864). Malacca.

107. CENTROTUS (?) FLEXICORNE, Walker.

Centrotus flexicorne, Walker, Ins. Saund. Hom. p. 78 (1858).

Black: pronotum pubescent, moderately high, very slightly ridged: lateral horns long, acute, diverging, obliquely ascending, slightly inclined backward, much curved, with a ridge near the hind border; posterior horn slender, ridged: femora black: tegmina tinged slightly lurid, tawny at the base, costa black towards the tip, veins testaceous; wings vitreous (*Walker*). Body long, $6\frac{1}{4}$; teg. $12\frac{1}{2}$ millims.

Reported from N. India.

108. CENTROTUS (?) OBLIQUUS, Walker.

Centrotus obliquus, Walker, Ins. Saund. Hom. p. 79 (1858).

Ferruginous very pubescent: pronotum rather high, somewhat scabrous, slightly ridged: lateral horns horizontal, moderately long, diverging, very slightly curved backward; posterior horn ridged, very slender, black except towards the base which is much above the abdomen, contiguous to the abdomen and hardly extending beyond it at the tip: legs tawny, femora black: tegmina tawny (*Walker*). Body long, $2\frac{1}{4}$; teg. $10\frac{1}{2}$ millims.

Reported from India.

109. CENTROTUS (?) CONGESTUS, Walker.

Centrotus congestus, Walker, Ins. Saund. Hom. p. 79 (1858).

Black, stout, short: pronotum pubescent, rather high, flat above: lateral horns stout, elongate-conical, directly diverging, obliquely ascending; posterior horn ridged, lanceolate, reaching almost to two-thirds the length of the abdomen: legs tawny; femora black: tegmina tinged slightly grey, a brown mark at the tip of the costa, veins tawny (*Walker*). Body long, $3\frac{1}{2}$: teg., $7\frac{1}{4}$ millims.

Reported from India. This is entirely different from the species described by Walker under the same name in J. L. S. Zool. x, p. 187 (1867) from Sula.

110. CENTROTUS (?) GIBBOSULUS, Walker.

Centrotus gibbosulus, Walker, Ins. Saund. Hom. p. 80 (1858).

Ferruginous, stout, short: head and pronotum pubescent, the latter oblique above the head: lateral horns conical, diverging, extremely short, hardly ascending and curved backwards; posterior horn ridged, lanceolate, black towards the tip, reaching to three-fourths of the length of the abdomen which is black: legs tawny, femora black, tegmina hardly tinged, brown at the base, veins tawny (*Walker*). Body, long $3\frac{1}{4}$; teg., $6\frac{1}{2}$ millims.

Reported from India. This species is entirely distinct from the species described under the same name by Walker in J. L. S. Zool. x, p. 187 (1867) and which should be renamed *C. walkeri*.

To these add :—

? *Centrotus laminifer*, Walker, J. Linn. S. Zool. i, p. 93 (1856). Singapore.
? *C. caliginosus*, Walker, l. c. p. 93. Malacca.
? *C. semivitreus*, Walker, l. c. p. 94. Singapore.
? *C. semifascia*, Walker, l. c. p. 94. Malacca.
? *Micreune formidanda*, Walker, l. c. p. 94. Singapore.
Sipylus crassulus, *Centrotus id.*, Stål. Freg. Eug. Resa, p. 285 (1859). Malacca.
Tricentrus fairmairei, *Centrotus id.*, Stål, l. c., p. 284 (1859). Malacca.
Gargara malaya, *Centrotus id.*, Stål, l. c., p. 285 (1859). Malacca.

To Genus LEDRA, and following add :—

Ledra auditura, Walker, List Hom. B. M. Suppt. p. 249 (1858). Hong-kong.
L. quadricarina, Walker, l. c., p. 249 (1858). Hong-kong.
Tituria nigromarginata, *Petalocephala id.*, Stål, Ofvers. K. V.-A., Förh., p. 158 (1865). Malacca.
? *Ledra cultellifera*, Walker, J. Linn. S. Zool. i, p. 98 (1856). Singapore.
? *Ledra conifera*, Walker, l. c., p. 98 (1856). Singapore.
? *Ledra nigrilinea*, Walker, l. c., p. 98 (1856). Singapore.
? *Acocephalus olivaceus*, Walker, List Hom. B. M. iii, p. 846 (1851). Malacca, Philippines.
? *Cœlidia guttivena* and *punctivena*, Walker, J. Linn. S. Zool. i, p. 99 (1856). Malacca.

111. TETTIGONIA ALBIDICANS, Walker.

Tettigonia albidicans, Walker, Ins. Saund. Hom. p. 96. (1858).

Whitish testaceous: a dot on the vertex, stripe on frons, triangular spot on face, two spots on posterior margin of the pronotum and one on the anterior margin, a spot on the scutellum, disc of the pectus, abdomen, tip of femora, tibiæ and tarsi and dots on the veins of the tegmina near the tips, black : posterior margins of the abdominal segments and the tip, testaceous : wings blackish lurid towards the tips and along the interior border (*Walker*). Body long, 10½ : teg. 21 millims.

Reported from Silhat.

112. BYTHOSCOPUS (?) PUNCTIFER, Walker.

Bythoscopus punctifer, Walker, Ins. Saund. Hom. p. 104 (1858).

Dull testaceous, stout, very minutely speckled black : a dot on each side beneath at the base of the antennæ, the abdomen above and tips of hind femora, black : tegmina testaceous, veins pale, punctured black ; wings vitreous dark brownish grey (*Walker*). Body long, 4¾ ; teg., 10½ millims.

Reported from India.

To these add :—

Tettigonia tripars, Walker, J. Linn. S. Zool. i, p. 97 (1856). Malacca.
T. suavissima, Walker, l. c., p. 97 (1856). Singapore, Borneo.
T. jocosa, Walker, l. c. p. 97 (1856). Mount Ophir.
T. suturella, Stål, l. c., p. 288 (1859). Malacca.
Jassus (Thamnotettix) sinæ, Stål, l. c., p. 293 (1859). Hong-kong.
J. (Thamn.) alacer, Stål, l. c., p. 293 (1859). Hong-kong.

113. FULGORA NIGRIROSTRIS, Walker.

Hotinus nigrirostris, Walker, Ins. Saund. Hom. p. 28 (1858).
Fulgora nigrirostris, Butler, P. Z. S. p. 98 (1874).

Orange : head black, ascending, as long as the body, green beneath, with orange streaks on each side by the eyes : thorax with a broad stripe, pronotum with a band on each side, mesonotum with a streak and three dots on each side and the anterior tibiæ, black : tegmina black, very closely reticulated orange and with six orange bands, the first and third bands regular, second slightly dislocated hindward where it sometimes joins the third, fourth formed of three small widely separate dots, fifth of 4-5 large spots usually confluent, sixth very irregular of 3-5 spots and dots of various size : wings with the apical third black (*Walker*). Body long, 36—44 ; teg. 63—75 millims.

Reported from India ?, Pachebon (Siam). Distinguished from *F. viridirostris* by its brighter orange colour, by its longer head, and by its tegmina, which are more regular and not bordered white.

114. FULGORA DUCALIS, Stål.

Hotinus ducalis, Stål, Trans. Ent. Soc. (3 ser.) i, p. 576 (1863).

♂, ♀. Testaceous : feet more obscure ; tibiæ, tarsi, antennæ, and venter blackish : tegmina sordid virescent-whitish, black-fuscous towards the apex, veins virescent; three transverse rows of spots before the middle; a broad band behind the middle; some small spots, girdled white, placed behind the band, the veins green; apical part sparingly sprinkled with small whitish dots: wings whitish-green, apical part, black: cephalic process very long, gradually compressly narrowed to the apex, moderately curved. In stature similar to *F. candelaria*, Linn., cephalic process longer and, seen from the side, broader, frontal ridges more distinct (*Stål*). Long, 42—46; exp. teg. 80—94 millims.

Reported from Cambodia.

115. FULGORA CÆLESTINA, Stål.

Hotinus cælestinus, Stål, Trans. Ent. Soc. (3 ser.) i, p. 576 (1863).

♀. Weak green-olivaceous, venter and feet black-fuscous: head obscurely fuscous-testaceous: tegmina pale sordid alliaceous with three virescent-veined, blackish bands, the first broad near the base, hardly visible except on the clavus, the second narrow, placed a little before the middle and very narrow in the middle, the third broad and with three pale virescent olivaceous spots, the apical part behind this band greyish-whitish sprinkled with pale-cinctured olivaceous spots; the disc of the apical areas fuscous: wings of a beautiful azure, apical part black. Allied to *F. ducalis*, Stål, but the cephalic process is longer, fuscous-testaceous, much curved. Head gradually compressly narrowed from the base towards the apex, a little longer than the body, not impressed above before the middle (*Stål*). Long, 41: exp. teg. 90 millims.

Reported from Cambodia. This species is very close to *F. connectens*, mihi, described from Tenasserim at p. 130 (1885).

116. PYROPS NOBILIS, Westwood.

Fulgora nobilis, Westwood, Trans. Linn. Soc. xviii, p. 146, t. 12, f. 10 (1841).

Pyrops nobilis, Walker (excl. syn.), List Hom. B. M. ii, p. 268 (1851); J. Linn. S. Zool. p. 96 (1856).

Head with a process which is straight, gradually attenuated, obliquely truncated at the apex, furnished with acute black tubercles arranged longitudinally in six rows, of which two are above, two beneath, and two lateral: eyes pale fuscous, a pale acute tubercle behind the eyes: antennæ pale: rostrum scarcely reaching the lateral pair of feet; head pro- and meso-notum and tegmina luteous greyish, slightly tinged virescent, sprinkled with minute black spots: metanotum and abdomen fulvous-fuscous, the latter with transverse black spots: tegmina with numerous larger fulvous dots: wings white, somewhat opaque; veins pale, tinctured virescent: feet concolorous, with black bands; last pair of tibiæ inwards immaculate, externally punctured black; tarsi luteous; claws black (*Westw.*). Body with cephalic process, long, 63; cephalic process, long, 25; exp. teg. 115½ millims.

Reported from Malacca, Sumatra. *P. javanensis*, Distant, is closely allied to *P. nobilis*, West., from which it differs thus:—the prolongation of the head is not prominently and dentately spined as in *P. nobilis*, but only obtusely spined, thus giving the head a much more slender appearance, the spines in both species being arranged in six longitudinal rows, two above, two beneath, and one on each side: the black spotting is also much more minute and the colour of the dorsal surface of the abdomen is different. *P. mustelinus*, Distant, also from Java, is allied to *P. punctatus*, Olivier, from which it differs by the much more prolonged head, the apex of which is not distinctly curved upwards, and which is also more spotted with black than in Olivier's species: the abdomen above is ochraceous and not black, &c.

Genus CYNTHILA, Stål.

Stettin Ent. Zeit. xxiv, p. 230 (1863).

Head narrower than the thorax; protuberance slender, porrect: frons much narrowed towards the base with two obsolete parallel ridges; vertex sinuated at the base, a little broader than the eyes, ridged longitudinally in the middle: second joint of the antennæ subglobose: rostrum extending almost to the apex of the abdomen: thorax in the middle produced anteriorly in an angle, longitudinally ridged in the middle, very broadly sinuated at the base: scutellum tricarinate: tegmina somewhat narrow, scarcely amplified towards the apex, rounded at the apex with longitudinal veins rarely furcated, almost entirely transversely venulose: wings less ample, tegmina much shorter, posterior margin not sinuated, transverse veinlets remote: feet slender, last tibiæ 5-spinose. Allied to *Ulasia* (*Stål*).

117. CYNTHILA FEROCULA, Stål.

Cynthila ferocula, Stål, Stettin Ent. Zeit. xxiv, p. 230 (1863).

♂. Livid: here and there pale ferruginous: almost entire clypeus, the cephalic process, and the basal limbus of the abdominal segments, infuscate: very broad streak on the frons, dilated towards the apex, four small spots on the vertex, two longitudinal lines diverging backwards, posteriorly abbreviated, also several small spots sprinkled over the thorax above and two spots on the same between the lateral ridges and a broad patch on the deflexed sides, minute spots scattered over the scutellum, and bands and spots on the feet, black fuscous: last tibiæ uncoloured: tegmina weakly ferruginous from the base to beyond the middle, opaque, sparingly sprinkled fuscous, apical part somewhat vinaceous, veined ferruginous sprinkled with larger spots arranged in a longitudinal row and some minute spots, black fuscous: wings vitreous, veined fuscous, infuscate at the base at the longitudinal veins. Close to *C. apicalis*, Westw., smaller, scarcely differing except in the shorter and more slender cephalic process, which is slender, not or scarcely thickened towards the apex, produced obliquely forwards and upwards, as long as the scutellum (*Stål.*) Long incl. ceph. process, 20; exp. teg. 48 millims.

Reported from Ligor, Malacca.

Genus SCAMANDRA, Stål.

Stettin Ent. Zeit., xxiv, p. 232 (1863).

Head not protuberant; frons a little broader beneath than above the middle, with the lateral margins of both halves somewhat parallel, and sinuated in the middle of the lower half, abruptly narrowed at the base and very slightly reflexed, not higher than the vertex, emitting from the base a small (mobile ?), cylindrical, furrowed corpuscule, reflexed above the anterior part of the vertex, furnished with two, sometimes obsolete, parallel ridges: thorax not ridged in the middle: first pair of femora not or scarcely amplified above at the apex; last pair of tibiæ, with three spines, furnished above at the base with a tubercle, often much elevated and acute *(Stål)*.

118. SCAMANDRA HECUBA, Stål.

Scamandra hecuba, Stål, Stettin Ent. Zeit., xxiv, p. 234 (1863).

♀. Ochraceous, beneath more obscure: tegmina less obscurely sordid subsanguineous, sprinkled with small fuscous spots which are sometimes encircled pale, almost half the apical part fuscescent-ochraceous anteriorly rounded, veined pale and subsanguineous: wings purely and obscurely sanguineous, the base itself black-fuscous, posterior limbus narrowly whitish, apical part fuscescent-ochraceous, anal area at the base with a fairly large flavescent spot: feet blackish: dorsum of the abdomen weakly sordid testaceous-flavescent, anus sanguineous. Close to *S. rosea*, Guérin, lateral margins of thorax more divergent, tegmina less broad near the apex, apex semicircularly not obtusely rounded; the apical ochraceous part of the tegmina is larger, anteriorly less distinctly not ending in a pale arch, remaining part without fuscous bands: wings scarcely whitish veined on the disc *(Stål)*. Body long, 23; exp. teg. 74 millims.

Reported from Ligor, Malacca.

119. SCAMANDRA SEMELE, Stål.

Scamandra semele, Stål, Stettin Ent. Zeit. xxiv, p. 235 (1863).

♂. Fawn-colour: basal two-thirds of the tegmina minutely, palely and sordidly sprinkled sanguineous, areolas of the apical part fuscescent in the middle: wings weak sordid sanguineous, base itself black-fuscous, spotted fuscous in the anterior area, posterior limbus whitish, spotted ochraceous, apical part fuscescent, veined ochraceous: abdomen sanguineous, genitalia black: feet, especially the tibiæ and tarsi, infuscate. Form of tegmina very distinct, they are amplified at the apex and rather obtusely rounded, costal margin straight, scarcely sinuated near the apex, commissural margin distinctly sinuated near the apex *(Stål)*. Body long, 13; exp. teg. 37 millims.

Reported from Ligor, Malacca.

120. SCAMANDRA ROSEA, Guérin.

Aphæna rosea, Guerin, Voy. Bél. Ind. Orient. p. 454, t. 3, f. 3 (1834); Walker, List Hom. B. M. ii, p. 274 (1851): J. L. S. Zool. i. p. 84 (1858).
Aphæna saturata, Walker, J. Linn. S. Zool. i, p. 143 (1857).
Scamandra rosea, Stål, Stettin Ent. Zeit. xxiv, p. 233 (1863).

Head without a prolongation, with the thorax yellow turning into ferruginous: pronotum strongly lobed in the middle of its anterior border, emarginate on its posterior border: tegmina yellow-ferruginous for two-thirds of their length, apical part saffron-yellow, a little browner on the margins: the reddish part is traversed by two oblique brown bands, of which the external is arched outwards with numerous small spots of the same colour between them: wings rosy turning into vermillion with yellow patches at the base and the tip; the posterior margin with a white smear in the entire rosy space, where also are irregular striæ more or less white: abdomen above and beneath vermillion-red with more yellowish transverse bands; feet brown (*Guérin*). Body long, 21; exp. teg. 65 millims.

Reported from Java, Sumatra, Malacca, Singapore.

121. APHANA FARINOSA, Fabricius.

J. A. S. B. liv, (2), p. 142, no. 26.

Head flat, dilated, obscurely ferruginous, with two farinose white spots: thorax ridged, obscurely ferruginous: tegmina white-farinose, at the base fuscous often varied ferruginous, at the apex fuscous hyaline: wings rufous at the base, punctured hyaline, black at the apex: body fuscous; abdomen flavescent (*Fabr.*).

122. APHANA ATOMARIA, Fabricius.

J. A. S. B. liv, (2), p. 143, no. 27.

A little smaller than *A. farinosa*, Fabr., body dull black ; head and thorax flavescent, spotless, the latter carinate : tegmina white-farinose at the base, more obscure at the apex ; with two marginal spots, one at the narrow margin, the larger posterior : wings sanguineous with several white-hyaline and dull black spots, black at the apex (*Fabr.*).

123. EUPHRIA DISCOLOR, Guérin.

Aphæna discolor, Guérin, Voy. Bél. Ind. Orient., p. 452, t. 3, f. 2 (1834) : Spinola, A. S. E. F. viii, p. 242 (1839) : Walker, List Hom. B. M. ii, p. 273 (1851) ; J. Linn. Soc. Zool. X, p. 96 (1867).

Aphæna blattoides, Walker, l. c. Suppt. p. 46 (1858).

Euphria discolor, Stål, Stettin Ent. Zeit. p. 232 (1863).

Head red, oblong, flattened, seen from above little prominent ; frons rounded and produced in a small horn curved backwards and scarcely reaching the middle of the pronotum, compressed on the sides and grooved ; front of the head oblong, labrum elongate, broad in front, ending in a point and covering the base of the rostrum ; the rostrum is longer than the head, four-jointed, tip extending to and passing a little beyond the last pair of coxæ : pronotum black, sinuate in front, finely bordered red, very slightly emarginate behind, about four times broader than long : mesonotum triangular, not so long as broad, almost twice as broad in the middle as the pronotum, ending posteriorly in an acute point ; it is black with a broad, transverse, rounded, red patch in the middle : the metanotum is not so broad and has several impressions and a smooth elevation in the middle ; it is blackish varied with red and has several white farinose patches : there is a small brown triangular piece at the base of the pronotum which covers the articulation of the tegmina ; the tegmina are oblong a little amplified at the apex ; two and half time longer than broad ; veins numerous, of a bright reddish brown especially at the base ; marked with irregular black patches more numerous beyond the middle ; tip of saffron-yellow passing gradually into red ; between the black patches and the red are large white farinose patches larger at the base and towards the side, which is also marked by large black patches or spots which become smaller towards the tip and form small patches which border the tegmina : wings black with the exterior border brown and the internal margin near the abdomen pale and a little transparent ; they are marked with white rounded patches, farinose and thicker at the base : the abdomen above and beneath brown, orange-yellow towards the borders of the segments, covered above almost entirely with a white powder similar to that on the wings: thorax beneath, femora and all the feet, red; anterior tibiæ and tarsi, black; intermediate pairs black outwards, reddish within, last pairs red with the tip and tarsi, black *(Guérin)*. Long, body, 23: exp. teg. 75 millims.

Reported from Sumatra, Java, Cochin-China.

124. EUPHRIA CORNUTA, Fabricius.

Lystra cornuta, Fabr., Syst. Rhyng. p. 57 (1803); Germar in Thon's Arch. ii, (2) p. 52 (1830); Guérin, Voy. Bél. Ind. Orient. p. 452 (1834).

E. (Callidepsa) cornuta, Stål, Hem. Fabr. ii, p. 87 (1868).

♂. Sordid sanguineous-flavescent: tegmina broadly sanguineous, sprinkled with numerous, here and there confluent, black spots, the very large disc behind the middle, black: wings and tibiæ sordid sanguineous; the tips of the tibiæ, tarsi, lateral margins of the thorax, and two lateral spots on the pectus, black: basal horn on the frons, erect, gradually acuminated, slender, somewhat larger than the vertex and thorax together *(Stål)*. Body long, 22; exp. teg. 70 millims.

Reported from China.

125. POLYDICTYA APHÆNOIDES, Walker.

Chalia aphænoides, Walker, Ins. Saund. Hom. p. 31 (1858).

♂. Ferruginous: abdomen black with red bands: tegmina with the apical third part paler: wings with whitish reticulations along the interior border and about the interior angle *(Walker)*. Body long 12½: teg. 37—38 millims.

Reported from Penang.

The present paper concludes this contribution to a '*Homoptera Indica*; for the families *Psyllidæ*, *Coccidæ*, *Aphididæ*, *Aleurodidæ*, &c. have practically been unworked in India, and whoever takes them up will probably have to ignore much that has been written about them. My object has been to provide those who may become interested in this order of insects with some guide to the classification and arrangement, and was at first devoted to the correction of our only English list, but this became so unsatisfactory that it was found better to revise the whole on the basis of Stål's numerous and elaborate essays. I have preferred where possible to give only the original descriptions, but where Stål, Signoret, Butler, or Distant have redescribed a species, their descriptions are recorded. It would have been desirable to give a new description of many species, but knowing the fruitful source of confusion which identification without comparison with types has proved in the history of this order, I have translated or transcribed, with some omissions and additions, the original descriptions, however unsatisfactory these were. This list of recorded species is, it is believed, tolerably complete, but we have not in our Indian Museum examples of even a moiety of those given, and I would now endeavour to enlist the efforts of observers in India to complete the series. The number of species here described under each family is as follows :—

Cicadidæ,	115
Cercopidæ	67
Membracidæ,	33
Jassidæ,	38
Fulgoridæ,	204—457

These with the species indicated as likely to exist but not described bring up the number to close on 500. These figures could probably be doubled in a few years, for the number of *Jassidæ* alone awaiting examination should add several hundred species to our Indian fauna.

INDEX.

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VIII.—*On a new Species of Uredine parasitic on* Cedrus deodara, *Loudon*.

By Surgeon A. Barclay, M. B., *Bengal Medical Service*.

[Received Jan. 16th;—Read March 3rd, 1886.]

(With Plates VI. and VII.)

This parasite is by no means conspicuous and is decidedly uncommon. It was observed during May 1884 at two isolated localities between Simla and Wangtu in the Sutlej Valley, and I have searched in vain for it among the numerous deodars about Simla. At one of the two places in which it was found (Turanda), it occurred on several trees, but at the other (between Sungri and Bagi), on two trees only. All the trees on which it occurred were well-grown, and it was observed that when a tree was attacked at all it was so very largely. A few needles only of certain rosettes of needles are attacked, and these when the affection is fully developed curve downwards (fig. 1.) This curling of certain needles gives the branches a curious frayed appearance by which alone attention is generally attracted to the occurrence of the parasite. The affected needles are not discoloured, but retain their normal green colour. The æcidia protrude in great numbers on the upper surfaces of affected needles, a single needle bearing sometimes as many as from 10 to 12 of them. They are generally arranged in a single row on one or other side of the middle line; but occasionally, towards the distal end of the needle, a second parallel short row exists. To the naked eye no spermagonia are visible, but with a field-lens they may be seen in great numbers as minute points scattered all over the needle.

The affection does not at first sight appear to cause much injury, but, when it is remembered that an innumerable number of needles are affected, and that these fall early, the conclusion cannot be resisted that so large a drain upon the assimilative organs of the tree must be attended with the most injurious consequences to its welfare. The fungus is confined entirely to the leaves, the mycelium never being found in the tissues of the stems bearing affected needles. The mycelium is therefore not perennial. Before entering upon a description of the structure of the fungus and of its morphological relations to its host, it is necessary to give an account of the normal structure of the needle.

Normal Structure of Deodar Needle.—The transverse section of a young normal needle is broadly quadrangular, one angle being superior, one inferior, and two lateral; the superior angle is truncated and grooved; as the needle grows older, however, the upper angle becomes gradually flattened until at last the section of an old needle is more triangular than quadrangular (fig. 8). On each of the four sides of the young needle there are as a rule four longitudinal rows of stomata, and on either side of the needle a resin canal, one of which is always larger than the other, though both are of the same structure. The centre of the needle is occupied by the wood bundle, the xylem being below and the phloëm above.

Looking next to the more minute structure of the tissues of the needle, it will be observed that the needle is clothed externally by a single layer of epidermis cells. Under this is a layer of thick-walled hypodermal cells, interrupted opposite the stomata, and double at the angles and between the stomata, where there is only space for a single cell; this layer is double also at each side of the resin canals. These cells are from three to four times as long as they are broad, and the epidermal cells are about one-third the length of the hypodermal cells. The resin canals are clothed internally by a layer of thin-walled epidermis cells supported externally at about three places by a second layer of similar cells: the whole is surrounded by a layer of sclerenchyma fibres, except where the canal is bounded by the hypodermal cells. Below the hypodermal layer follow large parenchymatous chlorophyll-containing cells radially arranged. These cells internally abut against the cells of an endodermal sheath surrounding the central vascular bundle, much in the same way as that in which palisade cells of leaves generally abut against the spongy tissue. This parenchymatous tissue is loose with numerous large air-cavities. The cells of the endodermal sheath are closely contiguous laterally, and are densely filled with starch grains. They are large cubical cells nearly twice as long as they are broad. The tissues enclosed by this sheath are:—(*a*) in the centre the xylem and phloëm divided into two lateral divisions; the xylem being below: (*b*) beyond the phloëm a group of much thickened sclerenchyma fibres: beyond these again and between them and the endodermis, (*c*) a set of large water-containing cells with numerous bordered pits. Laterally the place of these last mentioned cells is taken by smaller cells filled with starch grains and a few sclerenchyma fibres. Several of these characters may be seen illustrated in figs. 9 and 10, which, however, represent attacked needles.

Structure of Affected Needle.—The general outline of a transverse section is considerably altered (fig. 9). The parenchyma cells, especially near the æcidia, are larger and rounder than usual, losing their palisade like character and resembling spongy tissue (fig. 10). The resin canals have entirely disappeared. The parenchymatous tissue is invaded everywhere, but especially in the neighbourhood of the æcidia, by mycelial filaments. These filaments are, however, entirely arrested at the endodermal sheath. They are not convoluted except at the bases of æcidia. They are best seen in the air-cavities of the parenchymatous tissue and are of the usual characters, that is, branched, septate, and filled with clear fluid or finely granular matter (fig. 3). A few haustoria of the branched type penetrate the parenchyma cells (fig. 6). The æcidia are very superficial and measure about 0·177 m. m. in breadth by 0·166 m. m. in depth in transverse sections. At their bases the mycelium is densely aggregated, pushing aside and disorganising the parenchymatous and hypodermal cells (fig. 7.) The hymenium is flat and regular, and the rows of æcidiospores are given off from pointed sterigmata (fig. 7.) There are no intercalary cells between successive spores, and each row consists of about six spores.

The pseudoperidium is a very perishable structure, consisting of a single layer of more or less irregular cells irregularly arranged together and easily becoming detached from one another (fig. 5). In every transverse section of a needle through an æcidium from five to nine spermagonia are involved. They are very minute, measuring about 0·081 m. m in breadth by 0·045 m. m. in depth, and very superficial, being for the most part above the level of the epidermis. Their bases only are insinuated between the epidermis cells, and the underlying hypodermal cells are not displaced to any appreciable extent. The spermagonia are generally flattened on their summits (fig. 7.) They appear to have a special proneness to emerge on the margins of æcidia encircling them, for, in every transverse section of a needle passing through an æcidium, a spermagonium (or part of one) may be seen at either side of the æcidium (fig. 7.)

The æcidiospores are spherical or oval with orange-yellow granular contents (fig. 4.) The dry spores measure on an average 12·7 μ × 8·4 μ; but after moisture they swell considerably, attaining average dimensions of 17·9 μ × 14·8 μ. The epispore is very thick and beset externally with numerous prominent tubercles (fig. 4. c.), giving, in optic section, a radially striated appearance (fig. 4, a, b.) On my return to Simla about three weeks after gathering them they refused to germinate. Possibly the period during which they remain germinable had been exceeded, but possibly also they were not properly preserved during these three weeks.

Such then are the morphological characters of one stage of existence of a uredine inhabiting the most valuable of Indian conifers. I searched carefully for some clue to its further life-history but in vain. As the parasite does not occur in Simla, so far as I am at present aware, I have no immediate prospect of pursuing the investigation, but must leave it to any to whom facilities may be offered for undertaking the research. I have looked frequently on deodars for vegetable parasites, but beyond the one just described I have seen no trace of any other form. The remaining cycle or cycles of its development are therefore in all probability passed through on some other host.

EXPLANATION OF THE PLATES.

PLATE VI.

Fig. 1. General appearance of a rosette or fascicle of leaves with four needles attached. These are strongly curved whilst the unaffected leaves are straight. About natural size.

2. Appearance of æcidial fructification protruding through the epidermis. The black points indicate spermagonia. About 15 times natural size, as seen under a field-lens.

3. Mycelial filaments in an air-space in the parenchymatous tissue. × 580.

4. Æcidiospores; *a* and *b* in optic section: *c*, surface view showing tubercles on external surface of epispore. × 580.

5. Peridial cells. × 250.

6. Haustorium in a parenchyma cell. × 500.

7. Section through a ripe æcidium. On the right margin the section passes through the middle of a spermagonium, on the left it includes the margin of a second. × 250.

PLATE VII (Photographs).

Fig. 8. Transverse section of an old deodar needle, normal.

9. The same of an affected needle.

" 10. The same through an æcidium, more highly magnified.

IX.—*On three new Himalayan Primulas.*

By G. King, M. B., LL.D., F.L.S.

[Received and Read April 7th, 1886.]

(With Plates VIII., IX., and X.)

Since the publication of the *Primulaceæ* by Sir J. D. Hooker in his Flora of British India, several collections of plants from the higher parts of the Eastern Himalaya have reached the Calcutta Herbarium. Amongst these I find three species of *Primula* which I believe to be undescribed, and which I now describe and name.

1. **Primula Tanneri**, King. Glabrous, not mealy; basal sheaths short, broad, membranous. Leaves long-petiolate deltoid, with cordate base and acute apex, the edges irregularly and coarsely serrate, glaucous beneath when young and sometimes slightly puberulous, especially on the nerves, blade about 2 inches long and 1·5 in. broad; petioles 1·5 in. long, often narrowly winged. Scape slender, from 5 to 8 inches long, two- to eight-flowered, bracteoles minute subulate from broad bases, pedicels slender and unequal, some of them as long as the flowers. Calyx infundibuliform, cleft half-way down, the teeth lanceolate, rather longer than the tube of the corolla. Corolla bluish white; the tube cylindric or sub-infundibuliform, the throat with a dentate annulus, the limb ·75 in. across, deeply lobed, the lobes obcordate. Ovary globose pyramidal; the stigma sub-capitate. Fruit unknown.

Hab.—Sikkim Himalaya at elevations of about 11,000 feet, Col. H. C. Tanner: Chumbi Valley, Dr. King's collectors.

This approaches *P. geraniæfolia*, Hook, fil., *P. Kaufmanniana*, Regel, and *P. cortusoides*, Linn., in flowers and inflorescence; but the leaves are very different.

There is in the Calcutta Herbarium a specimen in young fruit, but without corollas, of a *Primula* which has leaves very like those of this species. It was collected by Mr. R. Pantling in the Lachen valley in Sikkim at an elevation of about 12,000 feet, and it evidently belongs to a nearly allied, but distinct species, which I have provisionally named *P. deltoidea*. Mr. Pantling notes that the corolla of his plant is purple with a yellow eye.

Some fragmentary specimens in the Calcutta Herbarium, named *P. Balfouriana*, Watt MSS., also come near this.

Plate VIII, fig. 1 *Primula Tanneri*, King, 2 corolla *natural size*, 3 calyx, ovary, style, and stigma, 4 corolla, 5 stamens, *slightly enlarged.*

2. **Primula Pantlingii**, King. Glabrous, not mealy; the sheaths very short. Leaves sessile ob-lanceolate, the edges remotely and obscurely sub-dentate, slightly revolute (at least when dry), about 1·5 in. long and ·3 in. broad. Scape 5 or 6 inches long, one- to two-flowered; bracteoles few minute subulate; pedicels rather stout, about ·2 in. long. Calyx narrowly campanulate, about half as long as the tube of the corolla, cleft about half way down; the teeth lanceolate-acuminate. Corolla yellow, glabrous, the tube sub-infundibuliform, the throat without an annulus, the limb about 1 inch across, deeply lobed; the lobes obcordate, the apical notches wide and deep. Ovary globose; stigma capitate. Fruit unknown.

Hab.—At Chopta, altitude about 12,000 feet, in the Lachen valley, Sikkim, growing in damp places and even actually in water: Mr. Pantling's collector.

This approaches *P. Dickieana*, Watt, but has narrower leaves and rather fewer smaller flowers than that species. The corollas of this are pale yellow with a darker yellow eye. They are extremely beautiful.

Plate IX, *fig.* 1 *Primula Pantlingii*, King, *natural size;* 2 and 3 corolla; 4 and 5 calyx; 6 anthers, *slightly enlarged.*

3. **Primula Jaffreyana**, King. Glabrous, slightly mealy when very young; the sheaths at the base of the leaves membranous short. Leaves obovate-elliptic, narrowed into a short winged petiole, the apex blunt, the edges irregularly and closely dentate; blade about 1·5 in. long, and from ·5 to ·75 in. broad; petioles from ·5 to ·75 in. long. Scape 3 inches long, many-flowered; bracteoles numerous, subulate; pedicels slender varying from ·5 to ·75 in. long. Calyx cylindrico-campanulate, about half as long as the tube of the corolla, 5-ridged externally, cut about half way down; the teeth linear-lanceolate. Corolla pale purple, the tube cylindrical, inappendiculate, the limb spreading, about ·5 in. across, rather deeply lobed; the lobes broadly obcordate. Ovary globose; stigma faintly 2-lobed. Fruit not seen.

Hab.—Chumbi valley, E. Himalaya, at elevations of about 12,000 feet; Dr. King's collector.

This approaches *P. Tibetica*, Watt; but has much larger, more membranous, leaves. I have named it after Mr. A. T. Jaffrey, Curator of the Botanic Garden, Darjeeling.

Plate X, fig. 1 *Primula Jaffreyana*, King, 2 calyx, 3 entire flower, *natural size*, 4 corolla and anthers, 5 ovary, style, and stigma, 6 anthers, *slightly enlarged.*

X.—*On the Life-History of certain Calcutta Species of* Satyrinæ, *with special Reference to the Seasonal Dimorphism alleged to occur in them.*—*By* LIONEL DE NICE'VILLE, F. E. S.

[Received 22nd April;—Read 2nd June, 1886.]

(With Plate XII.)

At the meeting of this Society held on the 3rd December, 1884, I read a paper on the Butterflies of Calcutta, and exhibited a series of specimens, chiefly appertaining to the subfamily *Satyrinæ.* In this paper I expressed the opinion that a very marked seasonal dimorphism occurred in this and other groups of butterflies. I also forwarded the same set of specimens to England, and my friend and colleague, Mr. W. L. Distant, exhibited them at the meeting of the Entomological Society of London for February, 1885. My object in bringing the matter thus prominently to the notice of both Societies was to ascertain from the members if they could throw any light on, or offer any opinion as to, the cause of these species being furnished, on the underside of the wings in the brood or broods (most probably the latter) that are on the wing during the rainy season, with strongly marked and conspicuous ocellated spots, while in the same species, or other species that take their place, during the cold and dry seasons these markings are obsolete or entirely wanting, and the general tone of colouration is much paler and more leaf-like. This expression of opinion may have been somewhat premature so far as the question of the seasonal dimorphism went, which certainly had not at that date been proved; but certainly not so far as the occurrence of ocellated species in the rains and of non-ocellated ones in the cold and hot seasons is concerned, facts of which I had convinced myself by long previous observation. It may be repeated that the Calcutta year is roughly divisible into a cold season (extending from the middle of October to end of March), a hot season (from April to middle of June), and a wet season or rains (from the middle of June to the middle of October).

A short discussion followed Mr. Distant's remarks on the specimens exhibited at the Entomological Society of London, but I was sorry to find that no solution of the phenomenon was suggested by the members present. My suggestion was that the obliteration of the ocelli was an advantage to the insects during the cold and hot seasons, as at those times the vegetation* is much more scanty and dried up, the insects live chiefly among the grass, and would consequently be easily seen were they not inconspicuously coloured and marked; while in the rains, the vegetation being then very dense, they can hide themselves, and their conspicuous livery is no bar to their safety. My belief that these ocellated spots are conspicuous and non-protective rather than the reverse, is, I am aware, contrary to the opinion of many eminent naturalists; I can, however, only state my opinion to the contrary for what it is worth and as the result of my own observations: I can see, for instance, a *Mycalesis mineus* with its big eyes and prominent white discal line far sooner and more easily than I can the plain evenly coloured and marked *M. indistans*, but whether this is so with the birds, lizards, Mantodea, predaceous flies, &c., which live largely on butterflies, I am unable to say. Having brought the subject to notice, I hope that it will attract the attention of observing naturalists, and that a solution of the question may soon be forthcoming.

As to the second point, whether the fourteen named species of butterflies referred to represent that number of distinct species or half that number, I have been able to prove by breeding direct from the egg that the extraordinary seasonal dimorphism which I had suspected to occur does actually exist in the case of four of them; the three remaining species must wait till the commencement of next rains, when I hope to complete the experiment.

The transformations of the genus *Melanitis* have long been known. As far back as 1829 Dr. Horsfield[*] figured the larva and pupa from Java of *M. leda* (= *M. determinata*, Butler); Mr. Moore[†] in 1881 figured those of *M. tambra* from Ceylon, and Surgeon-Major Forsayeth[‡] those of *M. ismene*. But the transformations of the large genera *Mycalesis* (containing 86 species, according to Mr. Moore's Monograph in 1880, and many new species since described) and *Ypthima* (containing 31 species up to 1877, according to Mr. Kirby's invaluable Catalogue) have hitherto been quite unknown. And yet, so far as my experience goes, it is very easy to breed them: it is only necessary to procure live females, and to shut them up in any kind of box, in which they will lay eggs; if the box has a gauze cover, the eggs will be found attached to it; if blades of grass, or, better still, a pot of growing grass, is placed in the box, the eggs will be laid on the grass. I have had no difficulty in getting species of *Satyrinæ* to oviposit, though I have often failed with butterflies of other families. I will now proceed to give in detail the results of my experiments.

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[*] Cat. Lep. Mus. E. I. C. pl. viii, fig. 9, *larva*; 9*a*, *pupa* (1829).

[†] Lep. Cey. vol. i, pl. ix, figs. 2*c*, *larva* and *pupa* (1880).

[‡] Trans. Ent. Soc. Lond. 1884, pl. xiv, figs. 2, *larva*, just before turning to a pupa; 2*b*, *pupa*.

1. YPTHIMA HUEBNERI, Kirby. Pl. XII, Fig. 1.

Y. hübneri, Kirby, Syn. Cat. Diurn. Lep., p. 95, no. 18 (1871); idem, id., Distant, Rhop. Malay., p. 57, no. 4, pl. vii, fig. 5, ♀ (1882); *Y. huebneri*, Marshall and de Nicéville, Butt. of India, vol. i, p. 226, no. 217, pl. xvii, fig. 65, ♂ (1883); *Y. philomela*, Hübner (*nec* Linnæus), Zutr. Ex. Schmett., figs. 83, 84 (1818); id., Hewitson, Trans. Ent. Soc. Lond., third series, vol. ii, p. 284, no. 4 (1865); *Y. howra*, Moore, Journ. Asiat. Soc. Bengal, vol. liii, pt. 2, p. 17 (1884).

On September 5th, 1885, Captain C. A. R. Sage[*] of the 18th Bengal Infantry sent me in a tin box with a gauze cover seven live females which had that day been caught. At the hour I received them (5-30 P. M.) they had laid over 70 eggs of a beautiful light green colour on the gauze cover, and two on the side of the box. On Sept. 9th, larvæ commenced to emerge, and I placed the gauze on which the eggs were laid amongst some grass growing in a pot, covering the whole with a large wooden box with glass sides. The larvæ rapidly fed up, and turned to pupæ, the imagines emerging between October 19th and 25th, as true *Y. huebneri* like their mothers. The pupæ were sometimes green, sometimes brown.

On my return on November 8th from my annual autumn holiday in the Sikkim hills, Captain Sage gave me six about half-grown larvæ which he had hatched on October the 20th from eggs laid by *Y. huebneri* on the 15th. Being few in number these larvæ were fed up by me in a stoppered glass jar, fresh grass being supplied about every other day. The first of them changed to a pupa on November 20th, and the imago emerged on December 7th; on November 22nd, another larva changed to a pupa, the imago emerging December 9th; on November 25th, two more larvæ changed to pupæ, the imagines emerging Dec. 12th; on December 3rd, another larva changed to a pupa, the imago emerging December 19th; on December 12th, the last larva changed to a pupa, the imago emerging on January 1st. All the pupæ were green, and all the imagines were true *Y. howra*. The colour of the pupa does not, I believe, affect the imago in the least; it is purely protective, the green ones in nature being probably attached to the green blades of grass, while the brown ones occur on the dark-coloured stems near the roots. The larva when full grown is about an inch or a little less in length, entirely green, the head round, body of nearly equal thickness throughout, slightly increasing in size to the fifth segment, thence gradu-

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[*] I am much indebted to this gentleman, who was at that time living on the outskirts of Calcutta (Alipur), for live specimens of the different butterflies with which I have experimented. He also bred the same four species from different batches of eggs, several of them more than once, and always arrived at the same results as I did, as I can testify from having perused his notes and inspected his specimens.

ally tapering to the anal segment, which is furnished with two very short diverging immovable processes or tails. The head and body are thickly shagreened, that is, covered with very small closely-set tubercles emitting fine colourless hairs. There is a dorsal line somewhat darker green then the rest of the body, which becomes white at the fourth segment, and extends right through the crown of the head. There is also a paler green lateral line below the spiracles. The pupa is either green or brown, with the head rounded, the edge of the wing-cases raised and angled anteriorly, the thorax humped, and marked, like the abdominal segments, with some dark brown waved lines and spots.

With regard to this species Mr. Butler remarks[*] that I have "yet to explain to which form, the dry or the wet, the intermediate grades" [between Y. *huebneri* and *Y. howra*] "belong." The intergrade forms referred to, in which "the ocelli are reduced to points," probably occur either at the beginning of the wet or of the dry seasons, though in the case of this genus I have noticed that the seasonal forms are less well-marked than in either *Melanitis* or *Mycalesis*: now and again a perfectly ocellated specimen may be found in the middle of the dry or cold season, or a non-ocellated one in the rains, but this does not much militate against the fact that in the rains the prevailing form will be ocellated, in the other seasons non-ocellated. The many variations that occur in this species are very fully treated on in "The Butterflies of India, Burmah and Ceylon." I was a little surprised to see that Mr. Moore, in the face of what is recorded in that work on this subject, and without any reference thereto, had described one form of it under the name of *Y. howra*.

Captain Sage first took *Y. howra* on November 18th, at a time when a few *Y. huebneri* were still on the wing, this being the earliest date on which he captured the cold and dry season non-ocellated form of this species.

2. YPTHIMA PHILOMELA, Johanssen. Pl. XII, Fig. 2.

I am unable to give the synonymy of this species, whose correct identification and geographical range are matters about which there is much uncertainty and difference of opinion. I consider that the species should be known as *P. philomela* (as pointed out by Mr. Kirby in his Catalogue), Johanssen having described it first from Javan specimens, of which there are a pair in the Indian Museum, Calcutta, collected by Dr. Horsfield in that island; these specimens are, so far as I can see, conspecific with the Indian ones. The *Papilio lisandra* of Cramer described from China may or may not be distinct, for I possess no specimens from that country for comparison. Mr. Moore considers the Indian species to be the *Papilio baldus* of Fabricius, who described it from India; in this he is followed by many authors, including Hewitson in his Monograph of the genus, who gives Java and Sumatra as well as India as its habitat. Mr. Elwes records it from China, Japan, and Amurland. Mr. Distant (who followed Mr. Butler) identified it as the *Y. methora* of Hewitson, and has sent me several specimens from the Malay Peninsula which I am unable to separate specifically from *Y. philomela.* Mr. Butler identifies[*] my Calcutta specimens as "*Y. methora*, Hewitson, variety." I have lately, since Vol. I of "The Butterflies of India" appeared, had the good fortune to obtain, from Mr. Otto Möller from Darjiling, and from Mr. A. V. Knyvett from Buxa, Bhutan, a considerable series of both the ocellated and non-ocellated forms of the true *Y. methora*, the former occurring in the spring (March and April), the latter in the summer (August). Hewitson's types were all three females, the locality from which he described the species being North India and, as given in Mr. Kirby's Catalogue of his collection, Sikkim and Yunan. The specimens Major Marshall and I identified in "The Butterflies of India" as *Y. methora* from Yunan do not appear to be that species (Hewitson seems to have made the same mistake, as he placed specimens from both Sikkim and Yunan under that name), having a sexual streak in the male, which the true *Y. methora* does not possess. I cannot therefore agree with Mr. Butler in considering the Calcutta species as a variety of *Y. methora*, of which Mr. Hewitson described and figured a female of the strongly-ocellated summer brood. *Y. laroides*, Westwood, is stated to occur at the Cape of Good Hope, but Mr. Trimen does not mention it in his South African Butterflies; and it also may be a synonym of *Y. philomela*. *Y. lara*, Donovan, is recorded from the Cape, but it is also unknown to me. Lastly, Mr. Butler described a species of *Ypthima* from Upper Tenasserim under the name of *marshallii*. Mr. Moore has kindly thus named for the Indian Museum, Calcutta, numerous specimens of the non-ocellated form of *Y. philomela*, and on this authority, in addition to the fact that these Calcutta specimens agree fully with Mr. Butler's description of *Y. marshallii*, I expressed my opinion that this species is nothing else than the non-ocellated form of *Y. philomela*. Mr. Butler (without having seen my specimens) denied the fact, but on seeing them subsequently, when Mr. Distant took them to the

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[*] Proc. Ent. Soc. Lond., 1885, p. v.

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[*] I have to express my indebtedness to Mr. W. L. Distant for having, after some difficulties and delays which have retarded the publication of this paper many months, obtained Mr. Butler's identifications of the specimens exhibited at this Society and also at the Entomological Society of London. When Mr. Butler wrote his remarks on my suggestions on the seasonal dimorphism obtaining in these species, he had not even seen the specimens in question!

British Museum for his inspection, he admitted that they are that species. This name, therefore, falls.—Leaving the confused and disputed question of the synonymy of this species, I will proceed to give the results of my experiments in breeding it.

On September 10th, Captain Sage sent me a tin box with net cover containing several females of *Y. philomela.* The insects had laid numerous eggs on the net, which differ considerably in colour from those of *Y. huebneri*, being at once distinguishable by the naked eye. On September 14th, two larvæ emerged. On September 18th, eighteen more emerged, and I placed all the young caterpillars in a stoppered glass jar on the same grass as that which was used for *Y. huebneri.* The larvæ are at first exceedingly small, pinkish-white in colour, hairy, and with a pinkish head. When full-grown, they are a full inch in length, rather larger therefore than *Y. huebneri*, with the body more compressed than in that species and flattened to a ridge line below the spiracles, the head rounded, the second segment a little larger than the head, the third and fourth segments gradually increasing to the fifth, then very gradually decreasing to the anal segment, which is furnished with two very small immovable pointed processes or tails. The larva is reddish-ochreous coloured throughout, not green as in *Y. huebneri*, with an indistinct darker dorsal line, two narrow subdorsal ones, and several other very narrow lines placed very close together in the spiracular region above the lateral ridge. There is also a subdorsal series of about eight short oblique streaks. The head and body throughout are shagreened, being covered with small tubercles bearing very fine short hairs. The pupa is either pale ochreous with darker ochreous and brown markings, or pale green with dark brown markings. It is very narrow, the thorax longitudinally humped above, with another ridge just before the abdominal segments placed transversely. On Oct. 8th, one larva; on Oct. 9th, seven larvæ; on Oct. 10th, two larvæ; and on Oct. 11th, one larva changed to a pupa. On Oct. 17th, three females emerged; on Oct. 19th, two males and one female; on Oct. 23rd, two females, and on Oct. 24th, one female emerged; and two larvæ died. All these butterflies proved to be true *Y. philomela* like their female parent.

On my return from Darjiling on November 8th, Captain Sage gave me eight very small larvæ which had emerged on November 4th from eggs laid by a female *Y. philomela* on October 29th. On December 16th, one larva changed to a pupa, which disclosed a male imago on January 5th; on December 18th, a larva changed, a female imago emerging on January 10th; on December 24th, a larva changed to a pupa, a female emerging on January 16th; and on December 28th, two larvæ changed to pupæ, a female emerging on January 19th from the one, and a male on January 20th from the other. Two larvæ died, having shrivelled up in the act of turning, possibly in consequence of the atmosphere of the glass jar in which I bred them not being sufficiently moist, for in nature these animals must get heavily drenched with dew every night. All these butterflies bred from eggs laid by *Y. philomela* proved to be true *Y. marshallii*. I may add that Captain Sage, who kept a careful register of his captures from day to day, first observed "wild" specimens of *Y. marshallii* on November 18th, having for months before caught *Y. philomela* only.

3. MYCALESIS MINEUS, Linnæus. Pl. XII, Fig. 3.

The synonymy of this species when it comes to be fully set down (and unfortunately I do not possess the necessary material from extra-Indian sources to attempt the task) will be stupendous. In India this species is certainly represented by *mineus*, Linnæus; *drusia*, Cramer; *polydecta*, Cramer; *justina*, Cramer; *visala*, Moore; and *indistans*, Moore; the first four species representing ocellated forms, the last two non-ocellated forms.

Males of typical *M. mineus* can at once be distinguished by an ochreous or pale golden elongated patch on the underside of the forewing near the base of the inner margin of closely-packed scales placed on either side of the submedian nervure near its middle, which patch is widely surrounded by an area of shining very closely-packed darker scales; a somewhat similar patch is also present on the upperside of the hindwing near the base of the first subcostal nervule. This patch is also found in typical *M. indistans* (and it is needless to state that it occurs also in *M. visala*, which is but a slight local variety of the latter form). In typical *M. blasius* and in its probably non-ocellated form *M. perseus*, these patches are very much smaller and black. Where these patches are well-marked and the characteristic markings occur with them, these two species, *mineus* and *blasius*, can be at once distinguished. But the identification of large series of specimens of this group of *Mycalesis* from various parts of India is complicated by this structural character appearing to be by no means constant, and moreover by the large yellow patch being sometimes associated with the markings of *M. blasius* and *M. perseus*, and the small black patch with those of *M. mineus*; so that when an attempt is made to sort them into separate species by one character, an unnatural result is obtained. I wish here only to draw attention to these circumstances. My own belief is that hybridisation takes place extensively. In Calcutta I have not as yet met with any of these puzzling specimens, but such seem to occur commonly in other parts of India. Local breeding experiments should be carried out to decide the question.

I will now give the results of my breeding of this species. On September 1st I placed two female *M. mineus* in a breeding-cage with glass top and sides into which I had previously introduced a pot of growing grass. The same evening the insects laid about thirty eggs singly and in batches on both sides of the blades of grass indiscriminately. The eggs are almost white, shining, and semitransparent. On September 5th, the one female died, and her body on being opened was found to be quite empty and devoid of eggs. On September 6th, the other female died, and most of the eggs hatched. As usual the young larvæ made their first meal off the empty egg-shells. They are pale green with a black head bearing two very obtuse black horns on the crown, and with the caudal processes very small.

Down to the last change of skin, the larvæ are pale green without any conspicuous markings; after that change they become pale reddish, finely mottled with greenish, ochreous, and other colours, the general effect being somewhat that of the brownish colour of a grass stalk to which the bases of the dead leaves are still attached. At this stage, the larvæ remain chiefly amongst the bases of the grass stalks, where they are very difficult to be seen. When full-grown, they are about 1¼ inches long. The first segment is somewhat narrower than the head, the body gradually thickens to the middle, and then equally regularly and gradually tapers to the anal segment, which is furnished with two short, slightly divergent pointed processes or tails. There is a very faint greenish dorsal line, with about six obscure darkish oblique streaks at the sides, the four middle ones of which are the most prominent. The head is blackish, armed with two divergent, blunt, conical horns, which are obscure reddish like the body; both head and horns are thickly set with small rough tubercles, and the face is covered with short hairs. The whole of the body is very rough or rugose, and very thickly set with minute tubercles. The legs and underside of the body are coloured like the upper surface. The pupa is usually pale semitransparent green without markings, quite smooth, with the thorax very convex above and constricted at the base of the abdomen, and with the spiracles black. I obtained one differently coloured pupa: this was rich reddish-brown, with the spiracles prominently bright yellow. The larvæ turned to pupæ between September 28th and October 4th, and butterflies emerged between October 5th and October 12th,—it seems, unnecessary to record the exact dates. The imagines, though variable, were all nearer to *M. indistans* than to *M. mineus*, while the majority were true *M. indistans*.

Mr. Butler* appears to consider the non-ocellated form of *M. mineus* (*M. indistans*) as rare. In Calcutta it is far commoner than the ocellated form, the former occurring for about two-thirds of the year, but the latter for the remaining third only.

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* Proc. Ent. Soc. Lond. 1885, p. vi.

4. MELANITIS LEDA, Linnæus. Pl. XII, Fig. 4.

The synonymy of this species also will be vast when written in full, as not only must all the numerous forms of *M. ismene*, Cramer, be added to it, but also the numerous intergrade forms that have been described, including that latest bantling of Mr. Butler's, *M. determinata*,* which, even if the "lurid" *M. leda* should prove constant, must sink under the far older name *M. ismene*. Its range is enormous: it occurs in Eastern, Western, and Southern Africa both as true *leda* (as universally accepted) and as *banksia*, throughout Southern Asia, in the Pacific Islands, and in Australia. Whether it presents dimorphic forms throughout its range, I cannot say. The specific extent of the genus *Melanitis* must long remain in doubt, until, in fact, breeding experiments have been carried out extensively; but I believe that there are several good species in India alone, though how many I am not prepared to say: in Ceylon, for instance, *M. tambra* is probably distinct from *M. leda*, in Sikkim *M. zitenius* and *M. tristis* may be good species, and so on.

I did not keep a very exact record of dates in breeding this species, as the transformations, as stated above, had been previously recorded, but, from eggs laid by *M. leda* (= *determinata*, Butler) in August, I bred, on September 6th, a female *M. leda*, on the 7th, another female; on the 8th, two female *M. ismene*, one with distinct ocelli, and therefore an intergrade between *M. leda* and *M. ismene*, though nearer the latter; on September 9th, one male and two females of *M. ismene;* on September 10th, three males and four females of *M. ismene*, several of which are intergrades, and one male *M. leda;* on September 11th, two males and one female (the latter a highly ocellated specimen) of *M. ismene;* and on September 12th, one male of *M. ismene:* the total result being that from nineteen pupæ bred from eggs laid by true *M. leda*, I obtained three specimens (1 ♂, 2 ♀ ♀) like the mother, and sixteen specimens (7 ♂ ♂, 9 ♀ ♀) of *M. ismene*, several of which, though transitional forms, were yet all nearer to *M. ismene* than to *M. leda*.

My efforts to breed a second generation failed, all the specimens dying without coupling or laying eggs.

Captain Sage first observed a specimen of *M. ismene* on September 23rd, the only *Melanitis* seen by him for several months previously being *leda*.

To conclude, I would earnestly ask entomologists living in the tropics to devote as much time and attention as they can to breeding butterflies from the eggs at different seasons, but especially, if the seasons are strongly marked, at the commencement or at the end of each change. My experiments have as yet been applied to four species only, and I think I may safely say that the results to most entomologists are most unexpected. I could indicate many dozens of Indian species in which I believe this seasonal dimorphism to occur, embracing nearly every family into which butterflies have been divided, but I might be again accused of "guessing." The subject is a most interesting one, and I hope to revert to it again before long.

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* Ent. Month. Mag. vol. xxi, p. 246 (1885).

EXPLANATION OF PLATE XII.

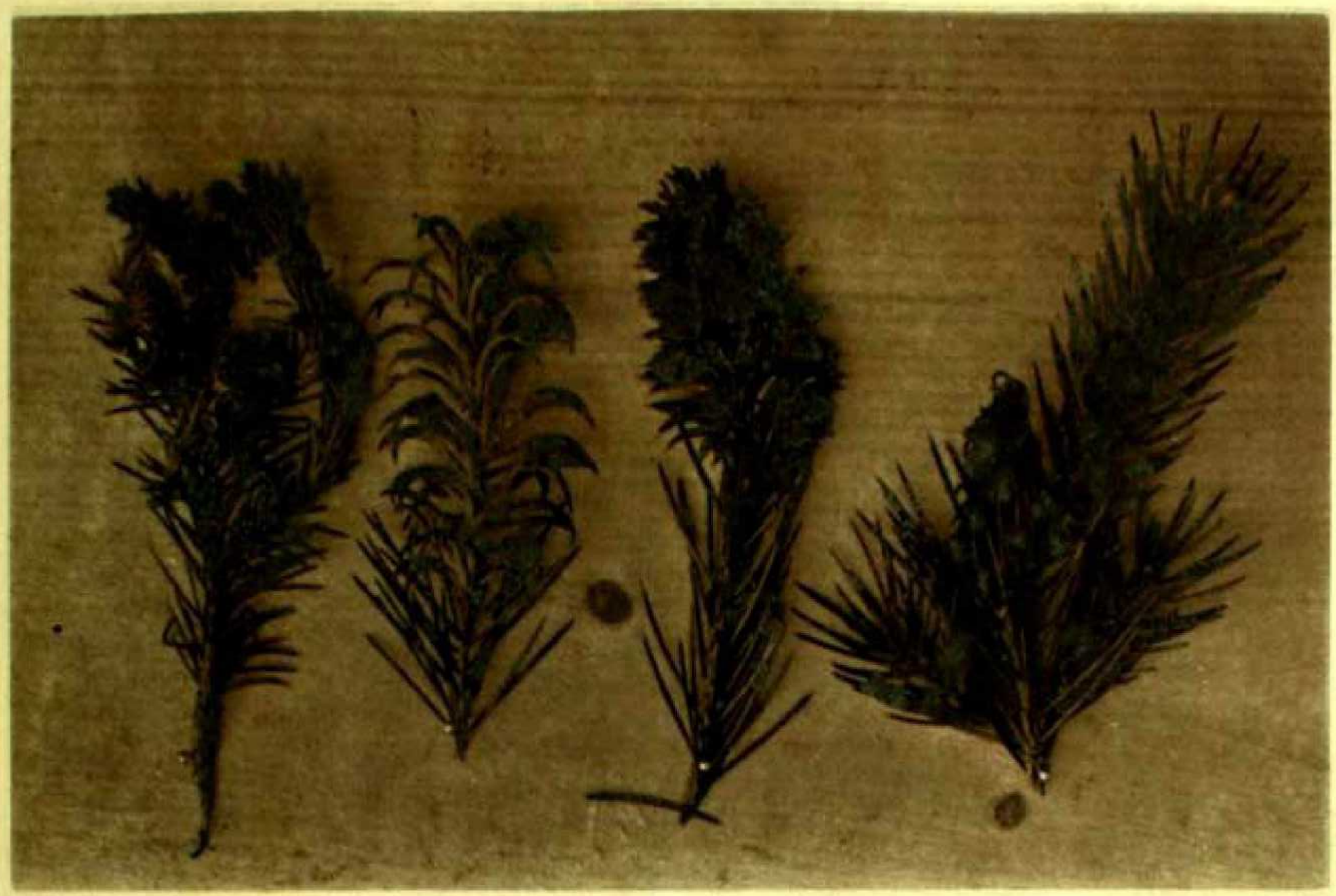
Fig. 1, Larva from above; 1 *a*, green pupa; 1 *b*, brown pupa; bred from eggs laid in captivity by true *Ypthima huebneri.*

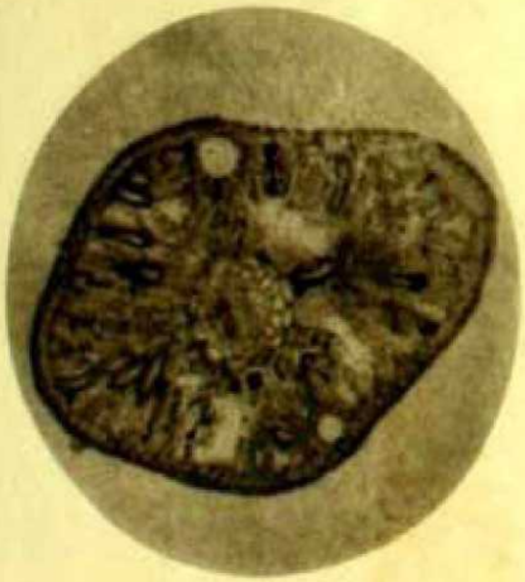
Fig. 2, Larva from above; 2 *a*, pupa; bred from eggs laid in captivity by true *Ypthima philomela.*

Fig. 3, Larva from above; 3 *a*, green pupa; bred from eggs laid in captivity by true *Mycalesis mineus.*

Fig. 4, Larva from above; 4 *a*, front view of head of full-grown larva; 4 *b*, pupa; bred from eggs laid in captivity by true *Melanitis leda.*

A. BARCLAY, Journ. As. Soc. Bengal, 1886, Vol. LV, Pt. II. PLATE III.





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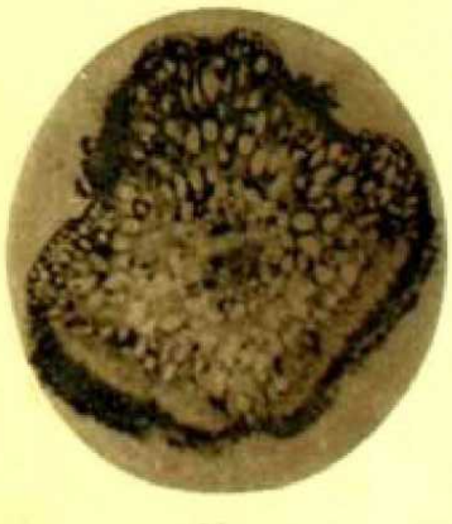

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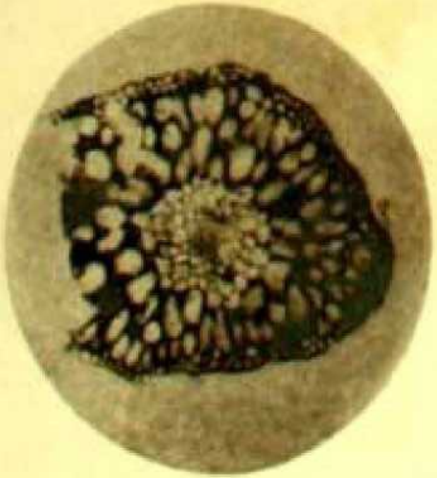

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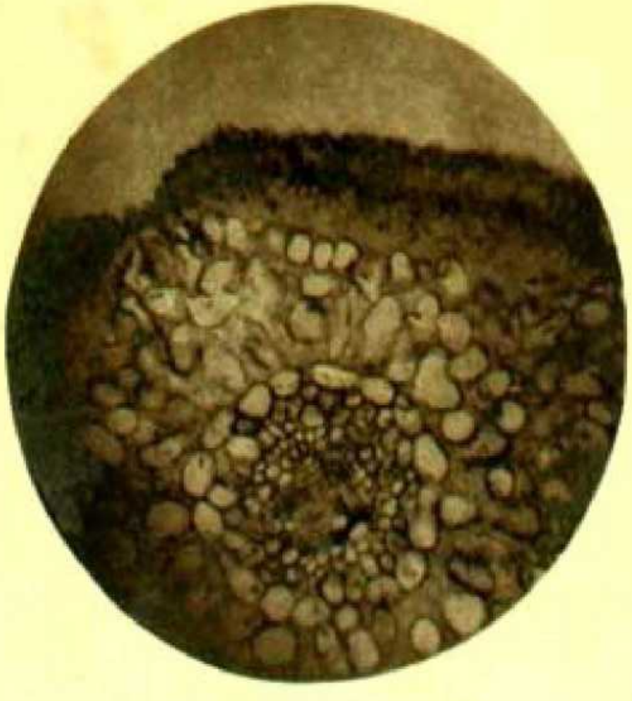

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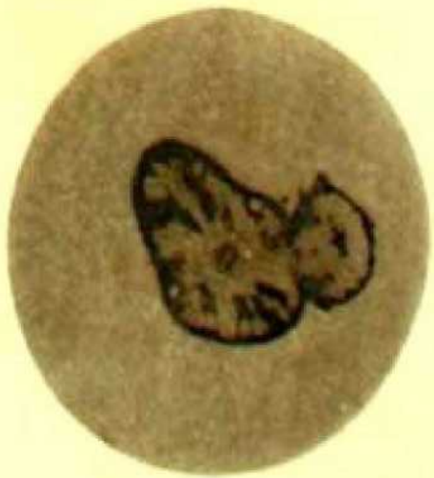

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Photo-Collotype

Survey of India Offices, Calcutta, April 1897

JOURNAL

OF THE

ASIATIC SOCIETY OF BENGAL.

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Part II.—NATURAL SCIENCE.

No. III.—1886.

XI.—*Indian Ants of the Indian Museum, Calcutta. No. 2.—By* PROFESSOR AUGUST FOREL, *Zurich. Communicated by the* NATURAL HISTORY SECRETARY.

[Received May 20th ;—Read June 3rd, 1886.]

I. Subfamily **Camponotidæ**.

Genus CAMPONOTUS.

1. C. SYLVATICUS, Oliv., subsp. *C. cognatus*, Sm., var. e. Also found in Sibsagar (Assam) and in Sind.

2. C. MICANS, Nyl., ☿ and ♀. Variety of colour: the body, the legs, and the antennæ are partially or totally reddish brown or pale ferruginous. Sibsagar.

3. C. GIGAS, Latr. (Hist. nat. Fourmis), ☿. Johore, Malay Peninsula.

4. C. SEXGUTTATUS, Fab. (Ent. Syst. II. 354.)

Subsp. *C. exiguoguttatus*, n. st. This subspecies resembles also *C. cingulatus*, Mayr, but *cingulatus* has long, quite erect hairs on the tibiæ and scapi.

☿. Length 5. 3—8. 3 millims. Narrow, like the *C. sexguttatus*, i. sp., and *C. cingulatus*. Clypeus slightly carinate, very slightly and shortly lobate anteriorly, hardly emarginate in the middle of its anterior margin. Mandibles with 6 teeth, very delicately reticulate, with scattered puncture. Legs shining, very delicately reticulate, moderately flattened, but not prismatic; without prickles. The whole body opaque (the head anteriorly slightly shining), very finely and closely transversely wrinkled, microscopically rugged between the wrinkles; the head partly reticulate. A very scattered and large, often hair-bearing, puncture at the anterior and middle part of the head of the ☿ major. On the abdomen, the base of the hairs is rather raised. Longer and shorter, often undulating, yellowish erect hairs are scattered over the whole body; but the tibiæ and scapi are only shortly, thinly, and very obliquely pilose (pubescent). A quite applied grey-yellowish pubescence on the whole body, especially on the sides of the thorax, the coxæ, and the abdomen. This pubescence is longer and more abundant than in *C. sexguttatus*, i. sp.

Colour of the ☿ major: the abdomen yellowish, with the anterior part and a narrow transverse fascia by the posterior margin of each segment brownish. Thorax reddish yellow. Head yellowish or brownish red. The head is regularly sprinkled, especially behind, with extremely minute (nearly microscopical), round, brown spots like freckles. Legs and funiculi brownish or yellowish red; scapi and mandibles brown.

Colour of the ☿ minor: the abdomen differs only in having the three posterior segments entirely brownish. The rest of the body reddish brown, much darker than in the ☿ major. Head without freckles. Legs, antennæ, and mandibles brown.

♀. Length about 12 millims. Long, narrow, cylindrical. Scale of the petiole not emarginate. Resembles the ☿ major, but less opaque; the scutellum and abdomen are even moderately shining. Everywhere more or less delicately reticulate, hardly here and there finely wrinkled on the abdomen. Colour of the head, legs, and antennæ like that of the ☿ major; colour of the abdomen rather like that of the ☿ minor. Thorax and petiole yellowish ar brownish red. Sides of the mesothorax and metathorax, two lateral fasciæ on the mesonotum and its anterior part brown. Wings tinged with brownish yellow; veins and pterostigma brownish. Sibsagar (Assam).

This subspecies is very distinct from *C. sexguttatus*, i. sp., which besides inhabits South America. But I have lately (E'tudes Myrmécologiques en 1879) found the *C. extensus*, Mayr, from Australia, to be a subspecies of *sexguttatus*. In the very variable groups of *Camponotus sylvaticus*, *sexguttatus*, *herculeanus*, which are distributed over the whole world, it is better to reduce the number of "species" as much as possible, because these are not constant. According to Mayr (Ants of Turkestan), the *C. variegatus*, Smith (from Asia), is a variety of *C. sylva-*

ticus, which I have also described (l. c.). It is possible, however, that the true *C. variegatus*, Smith (Cat. Brit. Mus. p. 18), is more closely allied to *C. sexguttatus*, subsp. *exiguoguttatus*.

Genus POLYRHACHIS.

5. P. BIHAMATA, Drury (Ill. Nat. Hist. t. 2, pl. 38, 1770), ☿. Tavoy.

6. P. ARMATA, Le Guillou (Ann. Soc. ent. Fr. T. X. 1841) (= *Polyrh. defensus*, Smith, Cat. Brit. Mus. p. 62; = *Polyrh. pandarus*, Sm., l. c. p. 65), ☿ and ♀. Sibsagar (Assam).

Var. *minor*, n. Length: only 7 millims. Abdomen bright rufo-ferruginous; legs brown; thorax and antennæ dark brown. In other respects like the typical form. Sibsagar.

7. P. SPINIGERA, Mayr (Verh. k. k. zool.-bot. Ges. Wien, 4 Dec. 1878). Sibsagar.

8. P. DIVES, Smith (Cat. Brit. Mus. p. 60) (= *acantha*, Sm., Proc. L. S. Z. V. 1860, p. 98, *sec.* Mayr), ☿. Sibsagar. The sole ☿ is a variety with the abdomen brown, the pubescence coarser and a little more fasciculate, the abdomen having coarser and more abundant raised wrinkles than the typical form. The pronotum a little broader anteriorly.

9. P. ACASTA, Smith (Proc. L. L. S. 1860, V. 100)? (perhaps = *argentea*, Mayr, Verh. zool.-bot. Ges. Wien 1862), ☿. The silvery pubescence is not dense. The spines of the metanotum are straight, divergent, twice as distant at the base as in *P. dives*, as long as the distance between their bases. Basal surface of the metanotum much broader than long (in *P. dives* longer than broad). Abdomen of the Sibsagar specimen brownish, legs reddish yellow with the coxæ, tarsi, and the base of the tibiæ blackish-brown. Length 5. 5 millims. Sibsagar.

10. P. FURCATA, Smith (Cat. Brit. Mus. p. 64), ☿. Variety with the abdomen black (rufo-testaceous in Smith's type). A very distinct, curious species, with the head and abdomen wholly smooth and shining, the thorax and petiole very coarsely, unevenly, and deeply reticulate (reticulate-punctate), the scale cylindric, much raised, bearing two long spines curved like chamois horns.

Smith's description is to be completed as follows:—

Thorax deeply emarginate between the mesonotum and the metanotum. Pronotum and mesonotum together strongly arched longitudinally and transversely. Basal surface of the metanotum very short. Clypeus carinate. Mandibles smooth and shining with scattered puncture. The whole body more or less covered with long, yellowish-white erect hairs and with a very scattered coarse pubescence. Tibiæ and scapi with long and perpendicularly erect hairs. Length 5. 5—6 millims. Sibsagar (Makes a nest in trees and is said to stridulate, but I have found no stridulating organs and suspect the insect merely scrapes dry leaves with end of abdomen.—Wood-Mason).

An aberrant specimen having the scale lower and more sqamiform, the scale-horns removed from one another and lowered towards the abdomen, the body more pilose, the thorax and the abdomen dark reddish-brown,—also comes from Sibsagar.

The *Polyrhachis furcata* belongs to the group "*armata*" of Mayr.

11. G. STRIATA, Mayr (Verh. k. k. zool.-bot. Ges. Wien 1862), ☿ and ♀. The hairs on the body are yellowish brown and not black as Mayr has stated. The ♀ is only 11 millims. in length, differing from the ☿ in having the abdomen very opaque, very closely punctured between the wrinkles; then the spines of the pronotum and the superior spines of the scale are shorter. The wings are wanting. Tavoy and Sibsagar.

12. P. MAYREI, Roger (Verzeichniss etc., Berl. ent. Zeitschr (1863).

Subsp. *P. intermedia*, n. st., ☿. Differs from the *P. Mayrei*, i. sp., in having only scattered erect hairs (the tibiæ and scapi have only a few very scattered erect hairs), the laminæ frontales more approximated, the abdomen brownish, with much less abundant gray (not golden) pubescence. The sculpture of the abdomen can easily be seen through the pubescence. Sibsagar.

This subspecies is allied to *P. proxima*, Roger (Berl. ent. Zeitschr. 1863), by its erect hairs and by its approximated laminæ frontales. But it differs from that species in the broadness and the stout form of its thorax (stouter than in *P. mayrei*, i. sp.), by its stout metanotal teeth, by the very distant superior spines of its broad scale, between which is a little tooth.

The *P. intermedia* induces me, however, to believe that the *P. proxima*, Roger, is also only a subspecies of *P. mayeri*. A specimen of *P. intermedia* has the abdomen black.

*13. P. RELUCENS, Latr. (Hist. nat. Fourm.) ? DECIPIENS, Roger (Berl. ent. Zeitschr 1863) ? ♀. This ♀ cannot be more accurately determined without the ☿. Pegu.

14. P. LÆVISIMA, Smith, var. DICHROUS n., ☿. Differs from the typical form only in having the abdomen and the legs yellowish fulvaceous, with the antennæ and the anterior part of the head reddish brown. The rest of the body is black. Sibsagar.

N. B. The species *Polyrhachis affinis*, Le Guillou, according to Mayr (Formicidæ Borneenses, Ann. Mus. civ. Genova, 1872), is synonymous with P. *bihamata*, Drury. The name *Polyrhachis affinis* must therefore be restored to the *Polyrhachis vicina*, Roger (*vicina*, Roger, Verzeichniss, 1863, = *affinis*, Smith, Cat. Brit. Mus. 1858). Thus the last species must be called "*Polyrhachis affinis*, Smith (*nec* Le Guillou) = *P. vicina*, Roger."

Smith (Proceed. Lin. Soc., March 1863) has described two different species of *Polyrhachis*, *P. dolomedes* (No. 1, p. 14) ☿ and ♀ from Ceram and *P. dolomedes* (No. 2, p. 16) ☿ from Waigiou, under the same name! Analogous mistakes have been committed several times by Smith: for instance, in Journal Proceed. Lin. Soc. Suppl. Vol. V, pp. 104, 105, two quite different *Ponera simillima*, Smith, are to be seen: the one p. 104 = *Lobopelta diminuta*, Smith, and the other p. 105 = *Ponera affinis*, Roger (sec. Mayr, Verh. k. k. zool.-bot. Ges. Wien, 1862, and Roger Berl. ent. Zeitschr 1860). But the double *Polyrhachis dolomedes* is not yet corrected, and I propose to name the *P. dolomedes* No. 2, *Polyrhachis pseuadonyma*, n. sp., if this species is not synonymous with *P. xiphias*, Smith (l. c.)!

Genus Œcophylla.

15. Œ. smaragdina, Fab., ☿ and ♀. Also found in Sibsagar, Pegu, Arrakan, and South Andaman Island.

Genus Myrmecocystus.

Wesmaël, Bullet. Acad. Roy. Bruxelles 1838, = *Cataglyphis*, Foerst., Verh. Nath. V. Rheinl 1850, = *Monocombus*, Mayr, Formicina Austriaca, Verh. z.-b. Ver. Wien, 1855.

16. M. viaticus, Fab. (Mant. Insect. sist. 1787), ☿. Kurhurbali. This Mediterranean species has hitherto been found to extend only as far as Persia and Turkestan, and is here recorded from India for the first time. The Indian specimens are typical, only a little more pubescent on the metanotum.

II. Subfamily **Dolichoderidæ**.

Genus Dolichoderus.

Lund, Annales des Sciences nat. xxiii, 1831 (Forel, Bullet. Soc. vaud. Sc. nat. vol. xv, 1878).

17. D. moggridgei, n. sp., ☿. Length 2.3 millims. Head short oval, broad, with very convex sides, very straitened behind, and there also semicircularly emarginate, about the neck of the pronotum. The posterior edge of the head, about the slope, is sharp, slightly raised, and nearly angle-shaped at both ends. Clypeus anteriorly with a deep, transverse, and curved impressed line, which runs from one anterior angle of the head to the other. The clypeus is very convex behind this impressed line. Frontal area and frontal sulcus indistinct.

Viewed from the side, the thorax ascends straight from the neck towards the middle of the mesonotum, this middle being the summit of an obtuse angle. From the middle of the mesonotum it descends again as far as the deep meso-metanotal strangulation. The middle of this descending surface is interrupted by the two protuberant stigmas. The basal surface of the metanotum is very abruptly ascending, hardly arched, and terminated behind by a transverse nearly rectilinear edge, which forms with the declivous surface a right or nearly acute angle. The declivous surface of the metanotum is plane above and concave below.

Viewed above, the pronotum is flattened, widened, trapeziform; the mesonotum is elongate and has a strong longitudinal impressed line with two edging blunt elevations in the middle of its sides; the basal surface of the metanotum is rectangular, longer than broad.

Scale raised, hardly inclined, moderately thick, evenly convex in front and behind, with the upper edge transverse and slightly rounded. The abdomen of the sole specimen is deformed.

Mandibles smooth aud shining with very scattered puncture. The whole body shining, especially the head. The head very delicately reticulate at the sides. On the anterior surface of the head, this sculpture passes into a very delicate scattered puncture, which replaces the reticulations. Thorax more or less delicately reticulate, except the declivous surface of the metanotum, which is smooth. Scale delicately reticulate or punctate. Abdomen with very delicate scattered puncture. No erect hairs. An extremely fine and much applied pubescence is scattered over the whole body, especially on the abdomen, on the scapi, and on the legs, where it forms a slight and delicate down.

Uniformly dark brownish or reddish yellow. Antennæ and legs clearer.

Gizzard (proventriculus) without sepals, of the same shape as in the other species of the genus *Dolichoderus*, for instance, very like that of *D. bispinosus*. I softened the abdomen in water, and was thus enabled to dissect out that organ without destroying the specimen. Sibsagar.

N. B. I have found the gizzard of *D. mariæ*, Forel, very like that of *D. 4-punctatus* of Europe.

III. Subfamily **Poneridæ**.

Genus PONERA.

18. PONERA LEEUWENHŒKI, n. sp., ☿. Resembles a little the *P. insulana*, Mayr, and *P. tesserinoda*, Mayr, but is quite distinct. Length: 7.5—8 millims. Mandibles shorter and broader than in *P. tesserinoda*, strongly striate, with scattered puncture above the striation, armed with 7 teeth.

A very distinct groove runs obliquely from the inner articular angle to the exterior edge of the mandibles (as in *P. tesserinoda* and *sulcata*). A much raised longitudinal carina in the middle of the clypeus (as in *P. insulana*), which is slightly acuminated or toothed in the middle of its anterior edge. Eyes smaller by half than in *P. tesserinoda*, situated on the anterior quarter of the sides of the head. Head broad, a little narrowed behind, and there broadly concave. The anterior edge of this concavity forms a right angle with the anterior surface of the head. The perpendicularly truncate posterior surface of the occiput is obliquely striate or wrinkled and shining. The sides of the head are more or less flattened and submarginate. Head longitudinally striate beneath, coarsely reticulate and finely granulate above (anteriorly). On the forehead and the cheeks the reticulations pass into longitudinal wrinkles.

Thorax moderately short; a lamelliform tooth at the anterior inferior angle of the pronotum. The meso-metanotal suture wholly obliterated. Declivous surface of the metanotum truncate, plane, oval, and margined by a small subdenticulate edge. This truncation is shining, transversely wrinkled below, the wrinkles being more effaced above. Pronotum semicircularly reticulate-rugose, mesonotum longitudinally so, both in addition with scattered and moderately effaced extremely coarse puncture. The basal surface of the metanotum with an extremely coarse and deep reticulate-punctate-rugose sculpture.

Scale like that of *P. tesserinoda*, but nearly twice as broad as thick. Its anterior and posterior surfaces are both truncate and transversely wrinkled. Its periphery has an extremely coarse and deep puncture, between which it is rugose. A rounded hump under the petiole.

Abdomen truncated anteriorly; the truncation shining and nearly smooth. The rest of the first segment reticulate-rugose (transversely so in front, longitudinally behind); besides, it is very coarsely scattered and effaced-punctured. The other segments of the abdomen are shining and delicately, more or less effaced reticulate-rugose (transversely so on the base, longitudinally so on the end of each), with scattered not coarse puncture. Legs and antennæ strongly punctured.

The spurs of all the legs pectinate. Some rare scattered erect hairs, especially on the tibiæ and scapi. A short, much spaced applied pubescence is scattered everywhere. This pubescence is extremely fine on the abdomen.

Brownish black. Abdomen dark reddish brown. Legs, antennæ, mandibles, *laminæ frontales*, and anterior edge of the head reddish. Sibsagar.

Genus BOTHROPONERA.

Mayr, Verh. k. k. zool.-bot. Ges. Wien. xii. 1862.

19. B. RUFIPES, Jerdon (Madr. Journ. Lit. & Sc. 1851, 119: *Ponera*), ☿. Sibsagar.

In the same box with *B. rufipes* (Sibságar Assam $\frac{222}{1}$) is another *Bothroponera*, which differs from *B. rufipes only* in having two stout, blunt, triangular, and flattened spines at the metanotum. These spines, or lamelliform large teeth, have a posterior concavity, which is directly continued into the declivous surface of the metanotum and sharp edged in common therewith, whilst the anterior convex side is directly continuous with the basal and lateral surface.

This toothed *Bothroponera* agrees in every respect with the description of "*Pachycondyla (Bothroponera) bispinosa*, Smith" (Cat. Brit. Mus. p. 107); only the longer tooth at the lateral angles of the scale is wanting.

Now Mayr (Journ. Mus. Godeffroy Hamburg, XII, 1876, p. 32) has found that *Bothroponera piliventris*, Sm., an Australian species closely allied to *B. rufipes*, offers a very peculiar sort of dimorphism in the ☿, the first category of ☿ having a narrow and entire scale, the second a broad and emarginate one.

The toothed *Bothroponera* (*bispinosa*) from Sibsagar agrees so completely in every minute detail, except the teeth or spines, with *C. rufipes*, that I venture to suggest that the two belong to the same species and constitute a new case of dimorphism in the ☿ of ants, *P. bispinosa* being the dimorphic form of *P. rufipes*.

It is easy to confirm or to refute my supposition by the observation of the living colony, especially of the pupæ in the nests.

Genus ODONTOPONERA.

Mayr, Verh. k. k. zool.-bot. Ges. Wien, 1862.

20. O. DENTICULATA, Smith (Cat. Brit. Mus. p. 90), ☿. Sikkim.

Genus LOBOPELTA.

21. L. MUTABILIS, Smith (Proc. Lin. Soc. Zool. 1861, p. 15), ☿. Sibsagar.

22. L. WOOD-MASONI, n. sp., ☿. Resembles the *L. castanea*, Mayr, but very distinct by its large and wide strangulation between the mesothorax and the metathorax.

Length 6·2 mill. Long and narrow; the legs, and especially the antennæ very long. Head oval. Eyes large, flat, situated at the anterior $\frac{2}{3}$ of the head. The second joint of the funiculus longer than the first. Mandibles rather broad, striated; their terminal edge long sharp, with a pointed tooth at the end and an obtuse one at its posterior third. Clypeus very triangularly advanced, nearly acuminated, strongly carinate, longitudinally striated. *Laminae frontales* extremely short; *sulcus frontalis* broad and short. The sides and the anterior part of the head longtudinally striated. Vertex and occiput shining, nearly smooth. Mesothorax strongly strangulated after the mesonotum; the strangulation much widened. Mesonotum small and narrow. The basal surface of the metanotum narrow, rounded, as long as the pronotum and the mesonotum together. The declivous one moderately short, transversely wrinkled, rounded at the sides and above. The rest of the thorax is shining and nearly smooth, except the sides of the mesothorax and of the metathorax, which are more or less rugose. Scale raised, narrowed in front, smooth and shining, as long as the breadth of its posterior surface. Abdomen shining and nearly smooth, strongly strangulated after the first segment.

Here and there a few erect hairs on the legs, the scapi, and the under side of the body. Applied pubescence nearly totally wanting. Yellowish or reddish brown, darker over the head, the thorax, and the scale. Funiculi, tibiæ, and tarsi testaceous. Sibsagar.

N. B.—Smith (Trans. Ent. Soc. Lond. 1876, Part IV, 6 Sept.) describes a *Ponera castanea* from New Zealand and says that the genus *Ponera* had not been previously ascertained to inhabit New Zealand. Now Mayr had previously (Novara Reise, Formicidæ, p. 69, 1865) also described a *Ponera castanea* (!) from Auckland (New Zealand); but I cannot ascertain if *P. castanea*, Smith, and *P. castanea*, Mayr, are two different species or not.

V. Subfamily **Myrmicidæ**.

Genus SIMA.

23. S. RUFONIGRA, Jerdon, ☿. Also from Sibsagar.

Genus CAREBARA.

Westwood, Ann. & Mag. Nat. Hist. 1841, vi. 86.

24. C. LIGNATA, Westw. (l. c. ♀); Smith (Cat. Brit. Mus. ♂), ♀, Sibsagar, ♂ Pegu.

Genus APHÆNOGASTER.

Mayr, Verh. z.-b. Ges. Wien, 1853, = *Atta* autorum, *nec* Fabricii.

25. A. BARBARA, L. (Systema Naturæ I. 962 ☿).

Var. *semirufa*, André (Species d. Formic. d' Europe, 1881-82), ☿ West shore of Sea of Galilee.

Var. *punctata* n., ☿ media-major. Length 6·3 millims. Head smooth and shining with very scattered, but distinct and moderately coarse puncture, besides with some divergent effaced striæ. Pronotum and mesonotum rugose. Two elongate tubercles on the metanotum. Dark reddish brown. Abdomen dark chestnut-brown. In other respects like the other varieties. Kashmir.

The *A. barbara* is a very variable Mediterranean species and has hitherto been found as far as Asia Minor and Turkestan, but not in India.

Genus PHEIDOLE.

27. P. INDICA, Mayr, ♀. Also from Port Canning, near Calcutta.

Genus CREMASTOGASTER.

Lund, Ann. d. Sc. nat. 1881, 132, = *Acrocœlia*, Mayr, Verh. z.-b. Ges. Wien, 1852.

28. C. SUBNUDA, Mayr (Verh. k. k. z.-b. Ges. Wien, 4 Dec. 1878), ☿ *variety*. Differs from Mayr's description only in having the mandibles entirely striated, the funiculi not clearer than the rest of the antenna, the second node of the petiole entirely smooth, the spines of the metanotum slightly concave exteriorly, and in being longer (4 millim.). Sibsagar.

29. C. FLAVA, n. sp., ☿. Length 4· 2—5 millims. Entirely of a pale yellow; only the posterior half of the abdomen with a brownish tinge. Slender; legs and antennæ rather long. Resembles a little the *C. rogenhoferi*, Mayr. The club of the antennæ 3-jointed. Mandibles closely striated. Head and thorax opaque. Head entirely longitudinally striated; its sides and posterior angles have besides a regularly spaced and rather coarse puncture. The striæ diverge towards the occiput, which has also sinuous, more or less transverse striæ.

Thorax rather narrow. Pronotum moderately flattened above, with the sides a little prominent. Mesonotum with two lateral carinæ, between which it is concave, a little enlarged in front, rounded at its anterior margin. Spines of the metanotum little divergent, moderately convex exteriorly, a little shorter than the interval between their bases. The declivous surface of the metanotum smooth, shining, much longer than the basal one. The rest of the thorax longitudinally rugose and delicately reticulate-punctate between the wrinkles.

The first node of the petiole viewed from above, as in *C. rogenhoferi*, flattened, broad, with a semicircular anterior edge, which is terminated by two angles at the middle of the sides. From these angles, each posterior half of the sides is concave and converges strongly towards the posterior edge, where it is terminated by a little protuberance. The posterior edge is emarginate between these protuberances. The second node is longitudinally and broadly, but not very deeply sulcated in the middle (the sulcus is deep in *C. dohrni*, Mayr, and *rogenhoferi*, Mayr). Petiole and abdomen shining and delicately reticulate; some longitudinal wrinkles on the second node.

Some erect hairs on the thorax and on the head, very few elsewhere, none at all on the tibiæ and scapi. A spaced, but regular, applied pubescence on the tibiæ, the scapi, the head, and the abdomen, very scattered elsewhere. Sibsagar.

XII.—*On some New Indian Butterflies.*—*By* LIONEL DE NICÉVILLE, F. E. S.

[Received 23rd April;—Read June 2nd, 1886.]

(With Plate XI.)

Family NYMPHALIDÆ.

Subfamily SATYRINÆ.

1. LETHE BRISANDA, n. sp., Pl. XI, Fig. 13, ♀.

DESCRIPTION. FEMALE. UPPERSIDE, *both wings* castaneous. *Forewing* with rather more than the outer half fuscous, crossed from the middle of the costa to near the anal angle by a decreasing white band, which is tinged with ochreous anteriorly, its inner edge very straight and sharply defined, its outer edge less regular and blurred; two small ochreous subapical spots divided by the fifth subcostal nervule. *Hindwing* with the outer half fuscous, bearing a submarginal series of four black spots placed upon a castaneous band, the upper one large and round, the second in the subcostal interspace somewhat quadrate and extending to the inner of the two pale marginal fine lines, the third and fourth in the median interspaces small and oval; there are faint traces also of a spot in the discoidal and a geminated one in the submedian interspace. UNDERSIDE, *both wings* pale ochreous-brown. *Forewing* with two ferruginous fine lines crossing the middle of the cell, the discal band as above but somewhat lengthened posteriorly, the ground-colour within it somewhat darker than the rest of the wing, a submarginal series of four small perfect ocelli placed between the veins, made up of a white pupil, a black ring, a ring of the ground-colour, a ferruginous ring, and an outer pale ring; two fine dark marginal lines. *Hindwing* with two discal fine irregular ferruginous lines from the costa to the submedian nervure, the lower disco-cellular nervule defined with ferruginous; a submarginal series of six perfect ocelli, made up of a black white-pupilled centre, then an ochreous, then a dark brown, and lastly an outer violaceous ring, the upper ocellus much the largest, the second and fourth subequal, as are also the third and sixth which are the smallest, the latter twinned; two fine dark marginal lines inwardly defined by a pale violet line and enclosing a fine ochreous line. *Cilia* pale brown throughout.

EXPANSE: ♀, 2·35 inches.

HAB.—Buxa, Bhutan.

Nearly allied to *Lethe dinarbas*, Hewitson, the female of which has not hitherto been figured or described, from which it differs on the upperside in having the ground-colour castaneous instead of pale brown, the discal band straighter and better defined, the ocelli on the hindwing smaller and blind; on the underside the ground-colour in *L. brisanda* is ochreous, in *L. dinarbas* it is pale brown washed with violascent, the forewing has four ocelli owing to the discal band being narrower, in *L. dinarbas* there are three only, on both wings in the latter the discal narrow lines are dark brown instead of ferruginous and broader and more regular. *L. brisanda* is nearly allied also to *L. hyrania*, Kollar, from which the castaneous ground-colour of the upperside and the much narrower discal band on the forewing will readily distinguish it.

A figure of *L. dinarbas*, female, is given (fig. 4) from a specimen from Native Sikkim in Mr. Otto Möller's collection.

The type and only known specimen of *L. brisanda* is in the collection of Mr. A. V. Knyvett, to whom I am indebted for the opportunity of figuring and describing it. The male has yet to be discovered: it will probably prove to be closely allied to *L. dinarbas*, which also occurs at Buxa, and to *L. hyrania*.

Subfamily NYMPHALINÆ.

2. NEPTIS KUHASA, n. sp., Pl. XI, Fig. 12, ♂.

DESCRIPTION. MALE. UPPERSIDE, *both wings* black with orange markings. *Forewing* with a broad discoidal streak bounded below by the median nervure, obscurely separated from the large triangular spot beyond by two fine black lines; a broad subapical patch well-separated from a rather less broad discal one which reaches the inner margin, and is strongly constricted at the first median nervule; a prominent submarginal somewhat lunate band, with a very obscure and fine pale marginal line. *Hindwing* with a broad straight even discal band, and a narrower (about one-third the width) submarginal similar band; marginal line as in forewing. UNDERSIDE, *both wings* with the ground-colour much paler, and the bands also paler, ochreous rather than orange. *Forewing* marked as above. *Hindwing* with an additional ochreous band at the base of the costal margin, the discal and submarginal bands broader (much reducing thereby the width of the band of the ground-colour between them), the outer margin broadly fuscous bearing a prominent ochreous line. FEMALE, *both wings* slightly paler. *Forewing* with the apex less produced. *Hindwing* with the discal band narrower, the submarginal band wider than in the male. UNDERSIDE with the same differences as above.

EXPANSE: ♂, 1·9; ♀, 2·0 inches.

HAB.—Cachar.

N. kuhasa differs from Upper Tenasserim specimens of *N. sattanga* in both sexes in the submarginal band on the upperside of the hindwing being narrower; the band of the ground-colour on the underside of the hindwing between the discal and submarginal ochreous bands is twice as wide, and in addition the outer margin of that wing is broadly fuscous, bearing a prominent ochreous line. In *N. sattanga* the margin is equally broadly ochreous inwardly bounded by a narrow black line, the extreme margin being defined by a very fine black line.

Mr. Wood-Mason took one male on the 29th July, and two females on the 8th August at Irangmara in Cachar, which specimens are now in the Indian Museum, Calcutta.

3. NEPTIS BURMANA, n. sp., Pl. XI, Fig. 9, ♂.

DESCRIPTION. MALE. UPPERSIDE, *both wings* black with prominent pure white markings. *Forewing* with the discoidal streak narrow, deeply indented at the end of the cell; the discal series of spots large and well-separated, the submarginal macular band distinct, with a pale line on either side. *Hindwing* with the discal band somewhat broad, straight, and even, followed by a pale line, the submarginal white macular band prominent, with a pale line beyond. UNDERSIDE, *both wings* dull ferruginous. *Forewing* with the triangular spot less prominently separated from the discoidal streak beyond, and the pale lines on either side of the submarginal macular band more distinct. *Hindwing* with a broad white basal band, two marginal white lines (there is only one pale line on the upperside), other markings as above.

EXPANSE: 2·4 inches.

HAB.—Upper Tenasserim.

Nearest to *N. cartica*, Moore, from which it differs on the upperside in having all the markings prominent and pure white; in *N. cartica* the markings are all obscure and tinged with fuliginous, except the discal band of the hindwing and the four spots on the forewing in continuation, which are white; the submarginal band also on the hindwing is more macular in *N. burmana*; and on the underside there are two marginal lines on the hindwing, in *N. cartica* there is only one, whereby the width of the band of the ground-colour between the discal and submarginal bands in that species is increased.

There are two male specimens of *N. burmana* in Major Marshall's collection, both taken by Captain C. T. Bingham, one in the Donat range in January, the other at Sekkan, Thoungyeen, in February.

Family LEMONIIDÆ.

Subfamily NEMEOBIINÆ.

4. ABISARA CHELA, n. sp., Pl. XI, Fig. 7, ♂.

DESCRIPTION. MALE. UPPERSIDE, *both wings* dark fuscous brown. *Forewing* with an oblique white discal band from the middle of the costa to about the middle of the submedian interspace, variable in width; a submarginal narrow white line, sometimes distinct throughout its length, at others blurred in the middle, but always ending in a distinct white spot at the costa; one or two short fine marginal white lines at the anal angle. *Hindwing* with two submarginal rounded black spots divided by the discoidal nervule, the upper one the smaller and outwardly circled with white, the lower one marked anteriorly and posteriorly with white; the outer portion of the discoidal and third median nervules orange; three somewhat indistinct black lunular spots on the margin in the median and submedian interspaces, inwardly defined with a pale line, the spot in the submedian interspace geminated; two fine interrupted white marginal lines; tail short and marked with white; an ill-defined discal pale band, inwardly sharply defined, outwardly blurred. UNDERSIDE, *both wings* much paler, all the markings more distinct. *Forewing* with the discal and submarginal bands much broader than above, the latter always well-marked throughout its length. *Hindwing* marked as above, but the space from the discal band to the margin irrorated with white, the outer portion of all the veins orange. FEMALE. UPPERSIDE, *both wings* paler than in the male, tinged throughout with ferruginous, the veins of the *hindwing* more broadly marked with orange. UNDERSIDE with the same differences as above.

EXPANSE: ♂, 1·75 to 1·90; ♀, 1·90 inches.

HAB.—Sikkim, Sylhet.

Allied to *A. neophron*, Hewitson, which occurs in the same places with it, and in Sikkim in the same months; differs from it in its smaller size, usually broader discal band on the forewing, the submarginal line usually more prominent, and always ending anteriorly in a white spot, which is never the case in *A. neophron*; markedly also in the length of the tail, this part being fully twice as long in *A. neophron* as it is in *A. chela*. Through the kindness of Mr. Otto Möller I have examined a long series of both species from Sikkim, and find that the differences given above are constant. He first recognized and pointed out to me the distinctness of these two species. For comparison I have figured (fig. 8) the upperside of a male specimen of *A. neophron* from Sikkim.

Family LYCÆNIDÆ.

5. ALLOTINUS MULTISTRIGATUS, n. sp., Pl. XI, Fig. 11, ♂, 2, ♀.

DESCRIPTION. MALE. UPPERSIDE, *both wings* dark brown. *Forewing* with a pale brown elongated patch in the middle of the disc. *Hindwing* unmarked. UNDERSIDE, *both wings* pale ochreous brown, covered (except the inner margin of the forewing) with hundreds of very minute spots made up of a dark brown centre and fine outer pale line. *Forewing* with three similar but larger discoidal spots, and a fourth below the middle one in the submedian interspace at the point where the first median nervule is given off; a similar submarginal series. *Hindwing* crossed by four almost equi-distant series of similar spots. *Cilia* pale brown throughout. FEMALE, differs in having the forewing more truncate and the hindwing more deeply scalloped than in the male. UPPERSIDE, *forewing* with the discal patch very prominent and pale ochreous, the basal half of the costal margin narrowly pale ochreous, with four short streaks beyond. *Cilia* pale ochreous. Otherwise as in the male.

EXPANSE: ♂, 2·1; ♀, 2·0 to 2·1 inches.

HAB.—Kumaon, Sikkim, Chittagong.

In collections W. Doherty from Kumaon and Chittagong; Colonel A. M. Lang, R. E., Otto Möller, and A. V. Knyvett from Sikkim. Quite different from any species known to me.

6. SATADRA TEESTA, n. sp., Pl. XI, Fig. 3, ♂.

DESCRIPTION. MALE. UPPERSIDE, *both wings* of a very deep purple, of a deeper shade than in any species of the group known to me. *Forewing* with a very narrow black marginal line. *Hindwing* with the black marginal line much broader than on the forewing; tail black, tipped with white. UNDERSIDE marked almost exactly as in *S. singla*, mihi.

EXPANSE: ♂, 1·8 inches.

HAB.—Sikkim.

Nearest to *S. singla*, from which it differs in the forewing being shorter and truncated instead of produced at the apex, the marginal black line only a quarter as broad, the colouration of both wings on the upperside of a deeper shade of purple. Obtained in the Teesta Valley, Sikkim, by Mr. Otto Möller, in whose collection the type specimen is deposited.

Family PAPILIONIDÆ.

Subfamily PAPILIONINÆ.

7. PAPILIO PAPHUS, n. sp., Pl. XI, Fig. 6, ♂.

DESCRIPTION. MALE. Intermediate between *P. glycerion*, Gray, and *P. tamerlanus*, Oberthür. Differs from the former in being larger, the forewing less profusely marked with black on the outer margin, both above and below, the hindwing having the disc crossed by a narrow black line which is joined posteriorly to a continuous subbasal line, the wing membrane between the discoidal nervule and the anal angle much broader. On the underside of the hindwing there is in *P. paphus* a series of six elongated streaks of the ground-colour divided by the nervules, from the costal nervure to the first median nervule outside the cell, these streaks being much shorter in *P. glycerion*, the ones in the costal, subcostal, and second median interspaces of that species being divided in the middle by a black bar into two spots, the anterior one in each instance being yellow, in *P. paphus* they are undivided and concolourous with the ground throughout. It differs from *P. tamerlanus* on the upperside (no figure is given of the underside of that species nor any detailed description) in having the two black bands at the end of the cell of the forewing parallel and conjoined in the middle as in *P. glycerion*, the black bands of the hindwing much less prominent. It is also a smaller insect, but agrees with it in the rounded apex of the forewing, and the width of the wing-membrane at the anal angle of the hindwing.

EXPANSE: ♂, 3 inches.

HAB.—Sikkim.

P. glycerion has a very wide range, occurring as far west as Simla at any rate, probably throughout the Himalayas eastwards, and in China. *P. tamerlanus* was described from Moupin, Western China, *P. paphus* is known to occur as yet only in Sikkim, specimens of it (including the type) are in Mr. Otto Möller's collection, also in that of Mr. A. V. Knyvett. For comparison, I have figured (fig. 5, ♂) the underside of a specimen of *P. glycerion* from Sikkim.

Family HESPERIIDÆ.

8. HALPE GUPTA, n. sp., Pl. XI, Fig. 1, ♂.

DESCRIPTION. MALE. UPPERSIDE, *both wings* dark brown. *Forewing* with two small spots in the cell placed obliquely one above the other, obsolete in one specimen, two or three conjoined subapical minute spots, two on the disc divided by the second median nervule. *Hindwing* with some long ochreous hairs in the middle of the disc. UNDERSIDE, *forewing* with the costa and apex diminishing towards the anal angle, and the whole of the *hindwing* clothed with greenish-ochreous scales. *Forewing* marked as above. *Hindwing* with two or three small pale opaque spots on the disc. *Cilia* cinereous, tipped with darker at the end of the nervules.

EXPANSE: ♂, 1·4 to 1·5 inches.

HAB.—Sikkim.

Near to *H. kumara*, mihi, differs somewhat in shape, the forewing being narrower and more produced at the apex, the subapical spots smaller. On the underside in *H. gupta* there are some pale spots on the disc of the hindwing, which are absent in *H. kumara*. The shade of the ground-colour is also quite different: in *H. kumara*, it is golden brown, in *H. gupta*, greenish-ochreous. The sexual mark is rather prominent. Mr. Otto Möller has obtained several male specimens in Sikkim.

9. PAMPHILA AVANTI, n. sp., Pl. XI, Fig. 10, ♂.

DESCRIPTION. MALE. UPPERSIDE, *both wings* fuscous. *Forewing* with a broad oblique subbasal streak, a more irregular and broader discal streak, both commencing close to the costa and extending to the submedian nurvure where they are joined, and a subapical streak, which joins the discal one, all yellow. *Cilia* very long and brown. *Hindwing* with a large irregular-shaped spot in the middle of the disc, with two very small and indistinct ones placed outwardly beyond it. *Cilia* pale yellow. UNDERSIDE, *both wings* much paler, ferruginous-ochreous on the hindwing; a dark ante-ciliary line. *Forewing* with the yellow markings much as above but paler and more extended. *Hindwing* with the discal spot larger and silvery-ochreous, with a small spot in the cell near the base and another of the same size beyond the outer end of the large discal spot, a lengthened pale ochreous abdominal streak. *Antennæ* short, with a prominent club, the shaft and club fuscous above, the club tipped with ferruginous below, and the shaft pale ochreous.

EXPANSE: ♂, 1 inch.

HAB.—Native Sikkim.

There are two specimens of this very pretty and distinct species in Mr. Otto Möller's collection, obtained by his native collectors probably at high elevations in Sikkim near the passes. It is unlike any hesperid known to me.

EXPLANATION OF PLATE XI.

Fig. 1. *Halpe gupta*, n. sp., ♂.
2. *Allotinus multistrigatus*, n. sp., ♀.
3. *Satadra teesta*, n. sp., ♂.

Fig. 4. *Lethe dinarbas*, Hewitson, ♀.
5. *Papilio glycerion*, Gray, ♂, underside.
6. ,, *paphus*, n. sp., ♂, underside.
7. *Abisara chela*, n. sp., ♂, upperside.
8. ,, *neophron*, Hewitson, ♂, upperside.
9. *Neptis burmana*, n. sp., ♂.
10. *Pamphila avanti*, n. sp., ♂.
11. *Allotinus multistrigatus*, n. sp., ♂.
12. *Nephis kuhara*, n. sp., ♂.
13. *Lethe brisanda*, n. sp., ♀.

XIII.—*Additional Notes on new or rare Indian Butterflies.*—*By* William Doherty, *Cincinnati, U. S. A. Communicated by the* Natural History Secretary.

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Family DANAIDÆ.

1. Euplœa (Trepsichrois) kalinga, n. sp.

♂. Differs from the male of *midamus*, Linn. (*linnæi*, Moore), only in the less brilliant blue of the forewing, with its spots larger and more distinctly white; and in the smaller male patch of the hindwing, extending neither to the apex of the cell nor to the lower median branch. ♀. Almost indistinguishable from the male, except in the absence of the male patch and the presence of a line of obscure whitish submarginal dots on the hindwing. A few paler streaks are usually visible on the disc of the hindwing subapically, but the cell is in all my specimens immaculate, a character in which it differs from all its allies.

I found this butterfly common on Mahendragiri and other mountains of the Ganjam District and in the Potingi Pass and the neighbouring country in the Vizagaptam district, Madras Presidency, and in the adjoining native state of Jaipur. I also saw a specimen flying in Orissa, near the southern boundary of that province. It probably represents *midamus* throughout the main line of the Eastern Gháts from the Godávari to the Mahánadi.

2. Euplœa (Trepsichrois) midamus, Linn.

One female taken by me in the Nicobars, on the island of Bompoka or Páhat, the most beautiful of that beautiful cluster of islands.

3. DANAIS (TIRUMALA) GAUTAMOIDES, n. sp.

♂, ♀. Differs from *gautama*, Moore (Arakan, Chittagong, and Tenasserim), in the whiter hyaline markings, all obscurely edged with dark on the underside, and in the deeper brown of the underside. The hyaline mark at the base of the cell of the forewing is bifid as in *gautama*, but the upper branch is the shortest, and is remote from the mark at the end of the cell, the latter being shaped as in *septentrionis*, but less oblique. The cell of the hindwing is usually cleft in three parts by slender black lines. Expanse 82 millimetres.

Apparently an insular representative of *gautama*; somewhat transitional to *limniace*. Common in the Southern Nicobars—Great and Little Nicobar and Kondul. It seems to be mimicked by *Radena nicobarica*, Wood-Mason and de Nicéville, which I have often taken in company with it. The closely allied *limniace* is common in Kar Nicobar, Teressa, Bompoka, Camorta, and Nancowry, but I have never found it in the southern islands of the group, where *gautamoïdes* abounds.

Family SATYRIDÆ.

4. MYCALESIS (VIRAPA) MANII, n. sp.

♀. Fuscous, white band of the forewing wider than in any allied species, and almost crossing the apex. Hindwing unmarked except by two submarginal lines obscurely darker. *Below* paler brown, a broad dull violet band across disc of hindwing, unmarked with white, its inner border nearly straight. This band is obscurely visible on the lower part of the forewing, not extending to the white band, below the white band one large ocellus, above it two apical ocelli set obliquely, the upper many times the larger, the ochreous rings of the two confluent. *Hindwing* with seven ocelli, the fourth blurred, the third smallest, the fifth as large as all the others united. Margin with an ochreous brown, and an obscure violet line bordered by dark lines. Cilia dark. The absence of the ocellus on the forewing above, and the violet band of the underside unmarked with white distinguish *manii* from the female of the Andamanese *radza*. From the female of the wet-season brood of *anaxias* (India) it differs on the underside in the uniform paler and more ochreous brown of the base; in the great breadth of the white band which extends almost to the end of the cell; in the very unequal ocelli, in the absence of the lilac gloss discally and submarginally; and in the darker apex, and obsolescent discal band of the forewing. Expanse 57 millimetres.

One female, Gonyi, Great Nicobar; two females, Ikuya, Little Nicobar; male not taken.

But for the differences in the venation I should have supposed *manii* identical with *anaxioides*, Marshall. I name this species for Mr. E. H. Man, Superintendent of the Nicobars, to whose kindness I owe the exceptional facilities which I enjoyed for visiting the islands under his charge.

Family APATURIDÆ.

Subfamily KALLIMINÆ.

5. DOLESCHALLIA POLIBETE, Cramer.

Kar Nicobar not common, probably an immigrant from the Andamans.

Subfamily ARGYNNINÆ.

6. CIRRHOCHROA NICOBARICA, Wood-Mason and de Nicéville.

♀. Differs from male in being duskier basally on the hindwing within the continuous discal black striga. Below paler, more ochreous, less ferruginous, more tinged with blackish, all the marks more distinct, the discal pale band of the hindwing wider, that of the forewing obscurely visible, very wide, bordered inwardly, and at the lower end outwardly, by a distinct reddish fascia, the submarginal fasciæ of the forewing more distinct than in the male, and the bent blackish line apically on the costa of the male absent. Great and Little Nicobar.

Subfamily APATURINÆ.

7. CYRESTIS TABULA, de Nicéville.

♀. Differs from the male in being white below instead of pale orange-ochreous; above it is only slightly tinged with ferruginous, and is somewhat like *thyodamas* except that the lighter spaces are heavily clouded with gray. When flying it more resembles the white Indian species *thyodamas* for which I at first mistook it. The male of the same species. Great Nicobar.

8. APATURA (or HYPOLIMNAS) MISIPPUS, Linn.

A male from Mount Harriet, near Port Blair, Andaman Islands. I have both sexes from Kar Nicobar, the female being as usual a mimic of *Danais chrysippus.*

YOMA, n. gen.

Resembles *Eurhinia*, Felder (*Rhinopalpa*) in the shape of its wings, and has the costa of the forewing similarly indented at the base. The hindwing, however, has but one lobe at the anal angle (two in *Eurhinia*), and is tailed at the upper median instead of the radial vein; its abdominal margin is less excavated. The outer border of both wings is straighter, and the forewing is not produced at the end of the lower median. Unlike *Eurhinia* the cell is closed in both wings; the first subcostal of the *forewing* is given off at one-sixth before the end of the cell, the second at two-thirds thence to the end of the cell, the third (which extends to the costa) at more than one-third between the cell and the apex, opposite the end of the first subcostal; the fourth and fifth bifurcate halfway thence to the apex. Upper disco-cellular distinct, very short, middle strongly angled inwardly, one-third above its lower end, lower slender, slightly concave, half again as long as the upper, reaches the median just beyond its last bifurcation. *Hindwing* with the præcostal vein slightly bifid, the cell closed by a slender vein somewhat bent inwardly, joining the costa considerably *before* the separation of its two upper branches. The radial is more curved than in *Eurhinia*, the internal short, = less than half the abdominal margin. The antennæ are slender and have about 51 joints, of which the club, which is small and cylindrical, has fourteen. The palpi are long and raised above the head, the last joint long and straight. The feet seem to have four claws.

The genus is rather close to *Apatura* (*Hypolimnas*), but the forewing is sharply angled at the end of the fifth subcostal, and the hindwing at the upper median branch. The disco-cellulars of both wings are very different from those of *Apatura*, and the forewing is indented at the base of the costa (as in *Eurhinia* and *Grapta*). The disco-cellulars also distinguish it from *Dichorrhagia*, which in venation comes nearest to it among Indian butterflies. From *Vanessa* and allied genera it differs in the short, broad cell of the forewing, with its deep, acute upper angle more remote from the base than the lower one.

As I have never seen *sabina*, I take *vasuki* for the type of the genus.

9. YOMA VASUKI, n. sp.

♂, ♀. Deep fuscous above with two obscure darker submarginal lines. Cilia whitish, anal angle irrorated with gray, obscure darker lines across the cell above and below. A broad band of pale reddish-ochreous crosses both wings discally, somewhat bent inwardly near the costa of the forewing, where it is cut by the dark subcostal vein. A series of three apical ochreous spots, the middle one distinct, the outer ones small and obscure. Two small white spots on the outer disc between the middle median and the lower radial, present in both sexes. On the hindwing, unlike *sabina*, the band is immaculate and narrows greatly in its lower portion, not approaching the abdominal margin. An obscure ocellus visible in some specimens on the hindwing outside of the band. *Below* the butterfly resembles a dry leaf; the prevailing colour is ashy gray with a faint silky gloss; the band of the upperside is faintly visible through the wing as a paler fascia, the two white dots more distinct, forming part of a discal line of black dots set in reddish irides, obscurely visible on both wings though obsolescent on the forewing; near the lower angle of which it includes a distinct and much larger black spot. Except in the breadth of the wings the sexes do not differ.

Egg very nearly as high as wide, spherical, slightly flattened above and below, shining green, with eleven or twelve slender radiating ribs meeting above.

Seen from the side, uncus strongly bent downwards, slender, with two very broad moveable wings, clasps deeply bifid.

I found it flying rather commonly in the open country at the foot of the Arakan Yoma near Sandoway, Arakan. It has the habits of *Apatura* (*Hypolimnas*) *misippus.* There are specimens (males only) in Major Marshall's collection and in that of the Indian Museum, labelled "Rangoon."

The allied *sabina*, Cramer, from Amboyna and Java, has according to Cramer and Godart the white discal spots of the forewing present only in the female. The ochreous band is very broad in both sexes, extending according to Godart, to the anal angle, and is marked with one or two black discal spots.

10. EURIPUS CONSIMILIS, West.

A male and a female, 5,000 feet, Potingi Peak, Eastern Ghâts, in the Vizagapatam District. They differ considerably from Himalayan specimens, and are perhaps somewhat transitional to the rare *meridionalis* from Travancore.

Family NYMPHALIDÆ.

11. PARTHENOS LILACINUS, Butler.

Great Nicobar, scarce.

Family LYCÆNIDÆ.

Subfamily THECLINÆ.

12. MYRINA (PURLISA ?) DONINA, Hew.

Sirtai Mountain, Lushai country, near the frontier of the Chittagong Hill Tracts, rare.

13. BIDUANDA LAPITHIS, Hew.

Barakhal, Chittagong Hill Tracts. My specimens do not agree very well with Hewitson's and Distant's figures and descriptions of Malaccan specimens.

Subfamily DEUDORIGINÆ.

14. DEUDORIX BARTHEMA, Distant.

Dimagiri and Barakhal, Chittagong Hill Tracts. The yellow colour of the underside of the female, which is not uncommon in the Chittagong

Hill Tracts, varies greatly in different specimens. I suspect that the male will be found to be of the usual dull rufous hue of below, characteristic of the group, and will perhaps be difficult to distinguish from some well-known species.

Subfamily LYCÆNINÆ.

15. CASTALIUS MANLUENA, Felder.

Allied to *roxus*. ♂. Black, tip of tails white, and a slender marginal white line on hindwing, broken at the veins. Both wings with a broad white discal band, extending on the forewing from the hind-margin to above the lower radial, just entering the cell, at the end of which it is strongly indented from above ; prolonged outwardly between the upper medians. On the hindwing it is broad, strongly produced outwardly, acutely indented inwardly. *Below, forewing*, ground white, base dark with a white longitudinal line close to the costa : a black mass extending obliquely from the base and the hind margin to the middle of the costa, where it joins a broad black subapical area which extends thence to the middle median branch, there it is connected (slightly) with the broad submarginal dark band, and with an outer discal dark area lying between the upper median and the hind-margin. *Hindwing* with a basal black mass untouched with white, and a discal band, irregular but unbroken, crossing the wing, and a submarginal line of wide, joined black lunules uniting at the apex with the discal band. Expanse 26 millimetres.

A male taken by me at Ikuya, Little Nicobar. The prehensores are quite distinct from those of the next species. The species is without metallic markings either above or below. Felder's female, with which this male seems conspecific, is as he remarks distinguished from *roxus* and allied species by the absence of all white at the base of the costa of the hindwing below. This also distinguishes it from *airavati*. The unbroken transverse discal band of the hindwing distinguishes the two Nicobarese species from all others. The female has, according to Felder, white marginal spots on both (?) wings above.

16. CASTALIUS AIRAVATI, n. sp.

♂. Allied to *ethion*. *Above*, light, shining blue, the outer borders of both wings broadly, and the costa of the forewing narrowly black. A white band crosses both wings. On the forewing its upper part is wide, centering between the upper median and the lower radial branches ; thence to the hind margin it is slender and almost obsolescent ; on the hindwing it is narrow and angular. *Below*, ground ochreous-white (white in *ethion*), pure white on the lower part of the forewing. It differs from *ethion* below in the increased size of all the black markings. The transverse discal band across the hindwing, though irregular, is continuous ;

on the hindwing its two parts are very close together; the upper one is widely united near the costa, with the outer of the two oblique basal stripes. The latter are united in both wings, enclosing a narrow white band. The two lines of submarginal spots are less equal and regular than in *ethion*, the inner being very large and forming an almost continuous and very heavy lunular line. The anal and subanal black spots are edged with silvery blue. Tails shorter than in *manluena*. Expanse 32 millimetres.

Two males, Gonyi, Great Nicobar.

Family PIERIDÆ.

17. NYCHITONA XIPHIA, Fab., var. NICOBARICA.

My numerous specimens from Great and Little Nicobar all have the black margin of the apex much narrower than in the typical *xiphia*, and the discal spot greatly reduced, and almost obsolescent. The genus does not seem to occur in any of the northern islands of the group.

18. DELIAS KANDHA, n. sp.

♂, ♀. A local form of *thisbe*, Cramer. Allied to *pyramus*, Wallace, from Sikkim. In *kandha* the ochreous anal area of the hindwing above is replaced by pale cream; the light discal areas on the hindwing below, which in *pyramus* are ochreous anally and whitish apically, are in *kandha* of an almost uniform bright yellow hue, inclining to lemon; the ochre spot at the base of the costa of the hindwing below is much larger and more distinct; the apical grey streaks of the forewing above are obscurely tinged with ochreous. All the pale marks are larger, and the black areas smaller and better defined. The female hardly differs from the male. Four males and three females taken on the Potingi Pass in the Vizagapatam District, Madras Presidency and the adjoining Jaipur State, at from 3,000 to 5,000 feet elevation on the Eastern Ghâts. Expanse 98 millimetres.

19. DELIAS ETHIRE, n. sp.

♂, ♀. A local form of *hierte*, Hüb. The male closely resembles *Delias hierte*, var. *indica*, Wallace (Assam to Upper Tenasserim). It is a whiter insect, the apex being but slightly clouded with gray, the subapical band distinctly marked being gray, with the spaces beyond it partly of almost pure white. The cell of the forewing is white above and hardly touched with gray below, the upper two or three apical pale spaces tinged with yellowish. Hindwing immaculate except for the gray terminations of two or three of the veins. The scarlet spots of the hindwing below are transmitted through the wing as a pink band. *Below*, the disc, base and abdominal margin of the hindwing are bright lemon yellow, becoming whitish outwardly on the disc, the scarlet submarginal band is rather narrow and even. ♀. Like the male, and has little resemblance to the female of *hierte;* it is white, all the veins accented with black, the extreme apex and the subapical band of the forewing dark gray, leaving a whitish band tinged with ochreous across the apex. *Below,* the female is like the male, the apex of the forewing is more distinctly marked with lemon-yellow, and the veins and subapical band are darker, the cell marked with perceptible gray lines. The brilliant lemon and scarlet hues of the hindwing are transmitted through the wing appearing above as creamy and pink. The two lower disco-cellulars of the forewing are less oblique and more angled outwardly than in *hierte,* resembling those of *eucharis.* Expanse 98 millimetres.

Common in the Vizagapatam District, Madras Presidency (at Bobbili, Parvatipuram, the Potingi Ghát, etc.), and in the Jaipur State, probably extending to the Godávari; scarce in the Ganjam District (Mahendragiri); also seen in Southern Orissa, where it is probably rare. From *eucharis,* in company with which I have often taken it, it is easily distinguished by the absence of the dark submarginal band on the hindwing above and below.

Family PAPILIONIDÆ.

20. Papilio doubledaii, var. sambilanga.

Intermediate between *doubledaii,* Wallace (India and Malacca), and *rhodifer,* Butler (Andamans). The tail is black as in *doubledaii.* Of the discal semicircle of whitish spots on the hindwing, that on the abdominal margin is very short; those between the middle median and the radial are generally absent above and quite rudimentary below. The anal orange spot is large, the marginal one at the end of the middle median is joined with the submarginal one between the two upper medians, both above and below (very much as in *rhodifer*). The female is similar, but the wings are wider and the tails much shorter and broader.

Great Nicobar, rather common.

Family HESPERIADÆ.

21. Erionota (?) lalita, n. sp.

♂. Above light but very bright ferruginous, slightly paler outwardly, marked with translucent ochreous spots set in black rings. On the *forewing,* one large triangular spot near the end of the cell, another larger and quadrate below it between the lower median branches, a third, much smaller and rounded, slightly beyond them between the upper medians. Below these, two minute ones with the translucent pupil obsolescent, set obliquely in the internomedian space; also five subapical ones, small, well-separated, the third and fourth furthest from the base, the third largest, the fourth and fifth minute. *Hindwing* with a transverse black spot at the end of the cell, and a semicircle of eight smaller ones on the disc round it, of which only one or two are pupilled with hyaline: the first, which is placed basally between the costal and subcostal veins, is obscure. *Below* duller ferruginous, the markings similar, the black rings of the spots of the forewing less distinct. Body densely clad with rust-red fur, eyes scarlet. Expanse sixty millimetres. ♀ unknown, probably very similar.

I caught two males, of which I unluckily have but one before me, on Sirtai Mountain (2,000 feet), in the Lushai country, north-east of Chittagong and south of Cachar.

The type of *Erionota* is *thrax*, but Mabille includes *irava* in the genus. On account of its possible affinity with that species (which I have never seen), I put this rare butterfly under the head of *Erionota*. It seems, however, to bear more resemblance to Felder's species of *Chætocneme* and *Netrocoryne* from the Australian and Austro-Malayan region. The following details of the structure of *lalita* will perhaps be useful to that bold man who may some day be found to undertake to systematize the *Hesperiadæ*.

Costal margin of *forewing* slightly convex, apex acute, outer and hind margins straight or a trifle convex. Costal margin of *hindwing* replicate, very convex basally, apex distinct, outer margin rounded, abdominal margin convex with a deep abdominal fold. Cell two-thirds of the length of the *forewing*, costal vein ends just before the end of the cell, first subcostal originates at nearly one-third before the end of the cell, then at decreasing intervals come the second, third, fourth (which extends to the apex) and fifth, upper radial from end of cell, disco-cellulars oblique, hardly angled, the lower longest. *Hindwing*, costal vein extends to apex, cell broad, quadrate, half as long as the wing, longest from base to its lower angle, disco-cellulars somewhat sinuate, upper two-thirds as long as the lower, or as the distance between the bifurcation of the subcostals and the end of the cell. Lower disco-cellular meets the median just beyond its last bifurcation.

Antennæ of about fifty-five joints, the club consisting of twenty-nine joints, is bent at a right angle, and tapers to a slender point. *Palpi* densely hairy, penultimate joint very thick and rounded, concave on both sides, last joint projecting forward, minute, blunt, one-fifth as long as the preceding one, in which it is more or less concealed. The *feet* each bear two long hairs, two claws, and two pubescent cushions or *pulvilli*. The front tibiæ are slightly swollen, with a very short spur in the middle, the middle tibiæ have two very long and unequal spurs at the lower end. The hind tibiæ are clothed with very long dark brown appressed scales (not hairs). At their end a pair of spines, and also two singular follicular appendages resembling the husk of oats, acicular, scaly, hollow, dark-brown, membranous, loosely attached, and about two millimetres in length. On the middle of the tibia is a single somewhat longer spine with an accompanying follicle.

* * *

XIV.—*On two new species of* Ilex *from the Eastern Himalaya.*—*By* George King, M. B., LL. D., F. L. S., *Superintendent of the Royal Botanic Garden, Calcutta.*

[Received May 8th ;—Read June 2nd, 1886.]

(With Plates XIII. & XIV.)

Both the species described below fall into the section of the genus *Ilex* which is characterised by having the flowers in very dense short axillary branched cymes, and with the fruit never more than 4-celled.

Ilex Sikkimensis, King. A glabrous evergreen diœcious tree 30 to 50 feet high, the young branches rather stout, their terminal buds covered by numerous large imbricated broadly-ovate blunt puberulous bracts, their bark pale yellowish ; leaves thinly coriaceous, 5 to 7 inches long, narrowly elliptic-oblong or oblanceolate, the apex acute, the edges finely serrate, the midrib very prominent, primary lateral nerves 10 to 12 pairs, distinct but not prominent ; flowers in shortly pedunculate glomeruli from the axils of the older leaves, bracts broadly acute, each bract with a 3-flowered, 2 to 3-bracteolate, cyme in its axil ; flowers of both sexes pedicillate 4-merous, the sepals ovate blunt, the petals broadly ovate connected by their bases ; stamens in the male flowers about as long as the petals, the anthers broadly ovate, in the female flower absent ; ovary, absent in the male flowers, in the female 4-celled with 1 ovule from the inner upper corner of each cell ; ripe fruit globose, 2 in. in diam., yellow, succulent, crowned by the remains of the quadrate stigma ; pyrenes 4, trigonous, grooved, each 1-celled and 1-seeded.

Sikkim, at elevations of from 6,000 to 10,000 feet, collected by Kurz, Gamble, Lister, King.

This species falls into the section with *I. insignis*, *dipyrena*, and *odorata*. It is the plant referred to by Sir J. D. Hooker in the Flora of British India, Vol. I, p. 599, as a possible new species near *odorata*, of which, when working up the genus *Ilex* for that work, he had seen only a single imperfect specimen collected in Sikkim by Mr. Brandis.

Although resembling *I. insignis*, Hook. fil. & Th., in many respects, this species is readily distinguished from that species by its longer-stalked smaller fruit, and from *insignis*, as well as from every other Indian *Ilex*, by the great broad bracts which cover the terminal buds of its young branches. This has moreover yellow fruit, while the fruit of *insignis* and *dipyrena* is red, and that of *odorata* is nearly black. Like *odorata* the fruit of this has 4 pyrenes.

Plate XIII. 1, Apex of branch of *Ilex Sikkimensis*, King; 2, cluster of ripe fruits; 3, bract of inflorescence, *of natural size;* 4, apex of ripe fruit; 5, base of the same, *slightly enlarged;* 6, male flower; 7, the same with the stamens removed; 8, the same dissected to shew the calyx; 9, stamens; *enlarged*.

ILEX HOOKERI, King. A small deciduous glabrous tree, the young branches rather thin, their bark pale yellow; leaves coriaceous, from 3 to 5 inches long, narrowly oblong or lanceolate, the apex acuminate, the edges serrate and slightly recurved when dry, midrib prominent, lateral primary veins 6 to 10 pairs, prominent, as also are the nerves; flowers in dense small sub-sessile axillary glomeruli which are covered when young by ovate-orbicular bracts; flowers pedicillate, the pedicels winged, 0·2 inch long, and with 2 or 3 lanceolate bracteoles near their bases; flowers unisexual or hermaphrodite, 4-merous, the sepals short, triangular, united by their bases, as also are the broadly-ovate petals; stamens short incurved, anthers broadly ovate; ovary surrounded at its base by a thin inconspicuous disc, fleshy, 4-celled, the stigma large thick discoid; ripe fruit globular, 0·2 inch across, crowned by the discoid stigma: pyrenes 4, obtusely trigonous.

On Tongloo in the Sikkim Himalaya, at elevations of from 9,000 to 10,000 feet; also in the Chumbi valley: Gamble, King, and Calcutta Botanical Garden native collectors.

This species also falls into the section with *insignis*, *dipyrena*, and *odorata*. It had not been collected when Sir J. D. Hooker worked up the genus for the Flora of British India. It is distinguished from all these by its smaller narrower leaves, but especially by the small glomeruli from each of which only 2 or 3 fruits are produced.

Plate XIV. 1, Branch of *Ilex Hookeri*, King; 2, ripe fruits; *of natural size;* 3, hermaphrodite flower seen from below; 4, 4, the same seen from above; 5, single petal and stamen; 6, stamens; *enlarged*.

* * *

XV.—*Insect-Pests belonging to the Homopterous Family* Coccidæ.

By E. T. ATKINSON, B. A., PRESIDENT.

[Received and read July 7th, 1886.]

In a recent paper on the Homopterous section of the Indian Rhynchote, it was remarked (p. 205 *supra*) that the group to which the *Coccidæ* belong had been practically unworked in India, and that whoever takes them up will probably have little aid from what has been written about them. Further research shows no reasons for modifying this statement; and the object of the present paper is to introduce the family to the notice of observers in India.

The more immediate cause of the early appearance of the paper is the receipt of letters from Ceylon asking for aid in the discrimination of Ceylonese species, and, as the inquiry is still in its infancy, it appears to me that the better plan will be to publish extracts from these letters in our Proceedings and invite the aid of those who are inclined to assist in this investigation. This aid may be afforded by collecting specimens *in spirits*, accurately watching and recording transformations and the seasons at which these occur; the soil, aspect, climate which appear to favour or retard the spread of the insects; accounts of any experiments for destroying the pests; general and particular effects of each species on tea, coffee, chinchona, or other economical products, local history of first appearance, continuance, &c., enemies of the pests, whether Hymenoptera, Coleoptera, or Acari.

COCCIDÆ.

Coccus, Linn.: *Coccidæ*, Leach, Westw.: *Gallinsecta*, Latr.: *Coccides*, Sign.

The insects of this family are commonly known as scale-insects or gall-insects and some of them, from the white farinose substance secreted by them, as mealy-bugs. They are common on almost all trees and plants in all parts of the world, and frequently commit great havoc on those cultivated for food or industrial purposes such as the coffee, tea, chinchona, orange, lemon, apple, and other fruit-trees: with the exception of the *Carteria lacca*, Ker, and a few others, their history has never been studied in India, and it is with the object of showing the character and forms of these insects sufficiently to aid in their determination that the following outline history of the family is given. It is chiefly based on the writings of Bouché, Costa, Westwood, Targioni-Tozzetti, Signoret, Maskell, Comstock, and Löw.

The Linnæan genus *Coccus* was divided by Geoffroy into two sections,

(1) *Chermes*, Geoff. nec. Linn. including those having the form of a shield and (2) *Coccus* for the remainder. Bouché further separated the genus *Chermes* of Geoffroy into two divisions, (*a*) :—those in which the body itself of the insect has or assumes the shield-like form, and (*b*) :—those in which the insect is concealed beneath a distinct moveable shield. It is, however, to the works of Targioni and Signoret that we have to look for the systematic classification of the insects of this family and for those characteristics common to nearly all the species on which the family is founded. The larval form has six legs, two antennæ, and two eyes, and there is no visible distinction between the sexes: the adult ♀ has usually neither wings, legs, nor antennæ, but is furnished with a setiform rostrum or sucking apparatus: the adult ♂, on the other hand, has two wings, two processes similar to the balteres of the Diptera in place of hind-wings, legs, antennæ, two and sometimes four eyes, but no rostrum: the adult ♂ also is less common than the adult ♀, indeed in some genera has not yet been discovered.

Signoret distributes the genera of this family amongst four subdivisions or sub-families :—

Diaspina :—Comprising those insects which are covered by a scale or pellicle composed partly of the exuviæ or moulted skins of each transformation and partly of a secretion formed by the insect itself and which is attached to the cast-off skin, the two forming a shield more or less independent of the body of the insect and which is variously called scale, shield, buckler, test, or puparium (*bouclier*, *schild*).

Brachyscelina :—Comprising species living in tubes or galls and of which the ♀ resembles the ♀ of the preceding sub-family and the ♂, with its hook-shaped genital sheath, furnished with lateral filaments, the ♂ of the *Coccina*.

Lecanina :—Comprising species either naked or inclosed or simply covered with a waxy or filamentary or even calcareous material: most of the ♀ take on an entirely different form after impregnation and then fixed to their food-plant remain so fixed for the rest of their lives. The lower-lip is one-jointed: the anal extremity is cleft and has two triangular lobes or plates above the cleft.

Coccina :—Comprising species in which the adult ♀ is naked or is covered more or less with a whitish waxy matter, varying much in form and consistence: the lower-lip is 2—3 jointed; the anal extremity is not cleft, but is produced in two tubercles more or less developed and prominent, each of which is furnished with a long bristle: the triangular lobes or plates of the *Lecanina* are wanting: at the last stage the ♀ is usually inclosed in a cottony or felted or calcareous envelope that forms a receptacle for the eggs.

Subfamily DIASPINA.

Diaspides, Sign., A. S. E. F. (4 sér.) ix, p. 98, 109 (1869): *Diaspidæ*, Maskell, Trans. New Zeal. Inst. xi, 189 (1879): *Diaspinæ*, Comstock, Rep. Dep. Agr. U. S. p. 278 (1880): *Diaspidæ*, F. Löw, Verh. zool-bot. Ges. Wien, xxxii, p. 513 (1883).

The genera falling under this subfamily, as we have seen, are distinguished by a shield or covering formed partly of the cast-off skins of the earlier stages and partly of a filamentary addition thereto secreted by the insect itself. Dr. F. Löw (l. c.) has recently bestowed some attention on the metamorphoses of this group, and I shall incorporate the result of his investigations in the following account of this subfamily :—

♂. In the adult, the head has four ocelli, two on the underside close to each other and two on the vertex behind the base of each of the antennæ, which are 10-jointed and placed close to each other at the apex of the head, each on a small tubercle: mesonotum in the middle with a transverse band (*apodema*) which is narrow and of equal breadth throughout, somewhat arched, very shining and convex and in most species of a darker colour than the rest of the dorsum. The abdomen is almost as broad as the thorax, broadly rounded at the extremity and furnished there with a knob or protuberance, from which proceeds the genital organ, which is as long as or longer than the abdomen: there are no caudal appendages. Wings oval, the basal lobe but slightly projecting; the hind-wings are wanting and are replaced by a pair of usually clavate processes, resembling the halteres or poisers of the *Diptera*, and furnished with a hooked bristle which fitting into a pocket or hollow in the fore-wings steadies them in flight. Legs moderately long; femora tolerably stout, somewhat flattened and with a notch on the underside near the base; tarsi with one joint, conical and ending in a simple claw and four knobbed hairs called digitules. The ♂ rests as larva and pupa under a variously shaped shield which is composed of a single larval skin and of an appendage formed of a stiff (neither filamentous nor felted) secretion, the latter attached to the margin of the former.

♀. In the adult, the body is circular, pyriform, oval, or longish-elliptical, strongly depressed, without any of the external organs except the rostrum or sucking setiform apparatus. Last abdominal segment (*pygidium*) very flat, sharp-edged, roundish, semi-circular or obtusely triangular, undivided, furnished on the posterior margin with small lobes, spines, hairs, and scales. There are visible under the microscope by transmitted light on the upper side of this segment a number of organs in the form of circular openings (*pores*) or tubes, which are either collected in groups or stand in irregular rows along the margins, and which are probably organs of secretion, hence the name spinnerets (*filières*). These organs afford specific and generic characters of value. The female individuals lie either in all stages free beneath a variously formed shield, which is made up of two larva-skins each with an appendage of stiff secretion at its margin, or they are enclosed as mature females in the second of the skins included in the shield, and then only the first skin possesses a secretional appendage. We shall now further examine the shield.

This shield varies much in shape and colour according to genus and species. As observed before, it is composed of the cast-off skin and a secretion formed by the insect itself. In the ♀ there are two of these cast-off skins present in the shield and in the ♂ but one. In both sexes the larvæ possess six legs, antennæ, and a rostrum, and are not distinguishable from each other. They attach themselves to the food-plant on which they live by the rostrum or sucking apparatus, and the abdomen soon begins to grow, the extremities, however, remaining of their original size. In this stage there is no shield, but, after the lapse of a few days, the first moult takes place, and the cast-off skin preserves the characters of the change that then takes place. From an examination of this skin it appears that, contrary to the process obtaining in the *Cicadæ* and other families of the Homoptera, in the first shedding of the skin the dorsal portion is entire, and it is the lower side of the front portion of the abdomen that bursts and allows exit to the insect. The skin of the dorsum is compact or felted and semi-corneous, whilst that of the sternum and foreparts of the abdomen is comparatively soft and delicate; and these characters are preserved in the exuviæ, which show the dorsal portion entire and the sternal portion burst open and often unevenly torn in the process. The larva then commences to deposit a secretion on the edge of this skin so as to gradually form an appendage varying in shape and colour according to the genera and species, and which together with the exuviæ form the shield under which the larva lives. Up to this point in their history there is no difference in the development of the sexes, but here they diverge.

♂. According to Dr. Löw, when the shield has been formed as above described, a second moult takes place and this time the dorsal surface bursts and the very delicate cast skin is not incorporated with the shield but is extruded posteriorly: the shield remaining the same. The appendage to the first larval skin formed by the added secretion varies in the different genera; in *Aspidiotus* and *Aonidia* this secretion surrounds the larval skin as a more or less broad, circular, oval or elongate-oval border, which is more or less convex according to the shape of the larva within it. It is attached too to the larval skin in such a way as to place the skin somewhat away from the middle towards the side of the shield. In the other genera, the larval skin lies at the base of the shield, whilst the attached secretion forms a straight caudal appendage, which is not so broad as, or but a little broader than, the larval skin itself. In *Diaspis* and *Chionaspis*, this appendage is parallel-sided, flat, with the sides and the middle longitudinally ridged, whilst in others it is convex, fluted, highest next the hinder end of the larval skin, and posteriorly generally somewhat flattened, with the sides parallel or a little dilated. The next change produces the adult ♂ already described.

♀. When the larva, after casting the first skin as already explained and after adding to it a secretion to form a shield, has attained to a certain age, it undergoes a second moult beneath the shield and becomes a fully developed female. The process undergone indicates two separate groups, which may be thus distinguished:—

(*a*). *Aspidiotaria*:—in the genera *Aspidiotus*, *Diaspis*, *Targionia*, *Parlatoria*, *Chionaspis*, and *Mytilaspis*, the ♀ completes the second moult exactly like the first, bursting through the skin on the underside, and the second skin, like the first, is shield-shaped, compact, felted, and entire, and becomes attached to the inner side of the first skin so as to form a part of the shield, under which the insect moves freely about. The perfect ♀ then completes the shield by adding to it an appendage formed of the same secretion as that produced by the ♂.

(*b*.) *Leucaspiaria*:—in the second group, formed of the genera *Leucaspis*, *Aonidia*, and *Fiorinia*, the second moult does not take place by the bursting of the skin, but the body shrivels up towards the head and thus becomes detached from the skin. The insect remains enclosed in the skin as in a cocoon, and the skin retains the shape and size of the larva from which it has been shed and is as large, or nearly so, as the shield which was already formed when this second moult took place, and adheres rather firmly to it. Above, it is compact and felted, below soft and thin, and completely envelopes the female, which ceases to grow and is, in fact, smaller than in the preceding larval stage. Therefore, in species belonging to this sub-family, the ♀ can be at once recognised by the presence of two cast-off skins in the shield, the first of the first moult with an appendage formed by the secretion referred to, and which varies in form with the genus, and, below it and to a certain extent behind it, the larger cast-off skin of the second moult, covered partly by the first skin and partly by its appendage. In those cases in which the adult ♀ is free, this second larval skin has a further secretion of its own, but in the second group, where the ♀

is inclosed, there is no such secretion. In no case is the shield composed of cast-off skins alone, and, where it appears so, closer examination will show the secretion.

In the ♀ as in the ♂, the shape and colour of the shield varies with the genera and species. In *Aspidiotus*, *Diaspis*, *Aonidia*, and *Targionia*, the shield is circular or oval with the first larval skin in or near the middle; in *Parlatoria* and *Leucaspis* it is produced, oval, with the first larval skin at or near the apex; in *Fiorinia* it is elongate and with parallel sides, and in *Chionaspis* and *Mytilaspis* it is mussel-shaped. Dr. Löw further observes* that the shields in the ♂ are smaller, narrower, and often quite differently formed from those of the ♀, so that, if we find one with a single larval skin attached, this character will help us to ascertain whether the insect beneath is a ♂ or ♀,—if the specimen be a ♀, it must be in the last larval stage, if it be a ♂, it must be either a larva or a pupa. In examining the ♀ of the second group above noticed, in which the ♀ is completely enveloped, care must be taken not to mistake the second larval skin for a dead larva. If it appears as a small thin pellicle not attached to the shield, it is a dead larva, but if be a stiff, semicorneous body attached by its dorsum to the first skin, it is the second larval skin and beneath is the living female. The following table gives Löw's arrangement of the genera of this group.

Table of Genera.

A. *Aspidiotaria* :—The perfect ♀ not enclosed in the second (lower) larval skin, which forms a portion of the shield, and which itself is smaller than the perfect shield and has a secretional appendage on its border.

a. Shield in ♀ circular or broadly oval, with the first larval skin placed in or near the middle.

a. Shield in ♀ flat, plate-shaped, not closed beneath.

1. Shield of ♂ oval or ovally produced, the larval skin placed somewhat away from the middle :—*Aspidiotus*, Bouché [Sign., A. S. E. F. (4 sér.) ix, p. 113, 1869].
2. Shield of ♂ long with almost parallel sides, scarcely broader than the larval skin which is placed at its apex with median and lateral longitudinal ridges :—*Diaspis*, Costa [Sign., l. c. 431].

b. Shield of ♀ highly convex, hemispherical, closed beneath by a secretional layer or plate; shield in ♂, produced ovally, larval skin almost at the apex :—*Targionia*, Sign. [l. c. x, 105].

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* Where there is difficulty in detecting the construction of the shield, the same writer recommends its being dissected in a solution of caustic potash or boiling water.

b. Shield in ♀ produced ovally or mussel-shaped, *i. e.* narrowed in front and gradually widened behind: first larval skin at the apex or very near it.

a. Shield of ♀ long, oval or elliptic: larval skin placed at the apex or near it: body of ♀ broadly oval: shield of ♂ long, narrow, with almost parallel sides :—*Parlatoria*, Sign. [l. c. ix, 450].

b. Shield of ♀ narrow at the apex, gradually widened towards the posterior part, mussel-shaped: larval skin placed at the apex: body of ♀ ovally produced or in form of an ellipse.

1. Shield of ♀ brown, more or less transparent: shield of ♂ brown, narrow, elongate, convex like that of the ♀. *Mytilaspis*, Targ. [Sign., l. c. x, 91: includes *Lepidosaphes*, Shimer].
2. Shield of ♀ white, opaque: shield of ♂ white, long, narrow, with nearly parallel sides, scarcely broader than the larval skin, flat, with median and lateral longitudinal ridges :—*Chionaspis*, Sign. [l. c. ix, 442].

B. *Leucaspiaria* :—Adult female enclosed in the second (lower) larval skin, which forms a portion of the shield, which is itself as large or nearly as large as the perfect shield and has no secretional appendage.

a. Shield of ♀ ovally produced or with parallel sides: the first larval skin ovally produced and placed at the apex of the shield.

1. Shield of ♀ ovally produced, white: the first larval skin yellowish or brownish, the second pitch- or red-brown: shield of ♂ very long, narrow, pure white, very convex behind the yellowish larval skin, somewhat flattened posteriorly :—*Leucaspis*, Sign. [Sign., l. c. x, 100].
2. Shield of ♀ narrow at the apex, then abruptly widened and produced, with almost parallel sides, delicate, brownish-yellow: shield of ♂ of the same shape but much smaller and narrower :—*Fiorinia*, Sign. [Sign., l. c. ix, 449].

b. Shield of ♀ circular or broadly-oval, rather flat: the first larval skin oval or almost circular, placed in the middle or slightly away from the middle of the shield: shield in ♂ oval, with the larval skin away from the middle :—*Aonidia*, Sign. [Sign., l. c. x, 102].

Maskell [Trans. New Zeal. Ins. xii, p. 293, 1880] has created a genus *Poliaspis*, which he describes as possessing the same character as *Leucaspis*, but it has also a fringe of spiny hairs set close together around the edge of the abdomen, which fringe is absent in *Leucaspis*.

Although no species of this sub-family has been recorded from India, we may reasonably expect to find the following or their representatives.

Aspidiotus aloes, Boisd., on *Aloe umbellata* [Sign., A. S. (5 sér.) ix, p. 114, 1869.]
,, *buddleiæ*, Sign., on *Buddleia salicina* [Sign., l. c. 115.]
,, *caldesii*, Targ., on *Daphne collina* [Sign., l. c. 116].
,, *ceratoniæ*, Sign., on *Ceratonia siliqua* [l. c. 118].
,, *chamæropsis*, Sign., on species of *Chamærops* [l. c. 118].
,, *destructor*, Targ., on palms, guavas [l. c. 121].
,, *nerii*, Bouché, on *Nerium oleander* [l. c. 126].
,, *pandani*, Boisd., on species of *Pandanus* [l. c. 131].
,, *palmarum*, Bouché, on species of *Chamærops* [l. c. 131].
,, *bicarinatus*, Walker, from China [l. c. x, 107].
Diaspis boisduvalii, Sign., on orchids [l. c. ix, 432].
,, *bromeliæ*, Kerner, on pine-apple [l. c. 434].
Fiorinia pellucida, Sign., on Areca palm [l. c. 449].

Sub-family BRACHYSCELINA.

Brachyscélides, Sign., A. S. E. F. (4 sér.) ix, p. 100 (1869) ; (5 sér.) vi. p. 591 (1876).

This sub-family was created by Signoret to contain several genera from New South Wales described by Schrader [Trans. Ent. Soc. Sydney, i (i), p. 1, 1863] and which live in galls or tubes on the *Eucalyptus* and other allied trees. The greater number of the galls of *Brachyscelis* were found on *E. hæmostoma*, though *E. corymbosa* and *Angophora lanceolata* were also infested by them. In *Brachyscelis*, the galls of the ♂ are trumpet-shaped and, in the figure given by Schrader, are attached to the underside of the leaf, whilst those of the ♀ are of an elongated bell-shape, with a cap which falls off when the gall arrives at maturity, and are usually placed on the small branches. At the end of this gall is found an opening or notch such as might be made by a knife and through it the ♀ receives air and also the larvæ escape. The two abdominal setæ of the ♀ appear through this orifice, which is always surrounded with a white farinose secretion. The larva is flat, nearly transparent, and of a yellow colour : the sides are furnished with hairs arranged in one row and there are two long anal setæ : the antennæ are about half the length of the body, 7-jointed and each armed at the tip with two small and two long hairs : tarsi 3-jointed, the last joint with a claw, which is also furnished with some small hairs. The adult ♂ is about two lines long, of a yellow colour and has one-jointed tarsi ending in two claws, one being stronger than the other : the anal setæ are nearly twice as long as the body ; the wings contain two longitudial veins : antennæ with ten-joints, which are neither very distinct nor regular: eyes prominent. These insects have hitherto been found only in Australia, but it is possible they may be found on the *Eucalyptus* imported thence and now common in India. The genera created by Schrader are:—

1. *Brachyscelis*, in which ♀ has six legs complete, but short and unfit for use.
2. *Opisthoscelis*, in which ♀ has only two long posterior legs.
3. *Ascelis*, in which ♀ is apodous.

In *Opisthoscelis*, the galls of both sexes are often found under the same leaf: that of the ♀ is in the shape of a pea, but somewhat larger; that of the ♂ is very small and conical. The ♀ of *O. subrotunda* is of a crimson red colour, nearly round, but the terminal segment of the abdomen is very much tapered; the ♂ is of a red colour, with anal setæ; the body, legs, and antennæ are very hirsute: long about 2‴.

In *Ascelis*, the ♀ larvæ alone form galls; the ♂ undergoing its changes within the gall of the parent ♀. This ♀ is of a pale yellow colour, the segments are hardly visible, and it appears as a mass of apparently inert matter without external members. The dorsum has a three-pointed corneous process, which always holds some gum apparently intended to close the opening of the gall, which is here always on the upper side of the leaf to which the gall is attached. The galls are usually of a large, globose form, and also in the form of large flat swellings on both sides of the leaves. The larva is flat and transparent, and resembles that of *Brachyscelis*, except that it is more pointed at the apex, has shorter antennæ, short anal setæ, and has not so much hair fringing the abdomen. The ♂ larva changes in the parent gall to a second form, which is red, active, and somewhat longer than the first change, but narrow and with very short anal setæ; after this it changes to a pupa and then to an imago, which is also of a crimson colour.

Subfamily LECANINA.

Lécanides, Sign., A. S. E. F. (4 sér.) ix, p. 100 (1869); (5 sér.) x, p. 268 (1870). *Lecanidæ*, Maskell, Trans. New Zeal. Inst. xi, p. 203 (1879): *Lecaninæ*, Comstock, Rep. Dep. Agr. U. S. p. 278, 330 (1880).

This group comprises those genera in which the insect is either naked or inclosed, clothed with a waxy or cottony substance, or even completely enveloped, and in such case the ♀ rests naked on its food-plant and forms a cottony secretion between the abdominal skin and the bark in which the eggs are placed. The form varies much; sometimes flat or globular, oval or circular, soft or semi-corneous. The rostral filaments have their source between the first pair of feet and first are directed towards the anal extremity and then turn backwards through a groove at their source. In the *Diaspina*, the rostral filaments are entirely free from their source; here in addition they are furnished with a one-jointed lower lip. In the *Coccina*, this lower-lip is 2—3-jointed. The antennæ are small, in the young insect and 6—7-jointed; in the adult 7—8-jointed; the two first joints are stout, short, the third generally longest, the last the most pubescent. Feet short, tarsi one-jointed, with a single claw accompanied by four hairs (*digitales*), of which the two upper are long and end in a small knob and the two lower are short and clavate. The body is usually ciliated and in some genera fringed. The ♂ in the larval and pupal stages is like the ♀; before entering the adult stage, a whitish or sometimes felted waxy pellicle is formed above which is detached from the body and beneath which appear the abdominal filaments. The adult ♂ has usually a small head, angular in front and on the sides, with several eyes and ocelli: in *L. aceris* there are ten in all, in others four, six, or eight: the antennæ are large and pubescent, usually ten-jointed, of which 4—6 joints are the longest, the last joint has sometimes hairs differing in size and shape: thorax more or less large, more or less gibbous with a band (*apodema*) more or less prominent, and often darker than the rest of the thorax: wings membranous, hyaline, pubescent, with a single vein, which bifurcates near the base and sends one branch to the costal, the other to the internal margin: in place of hind-wings are processes similar to the halteres or poisers of the *Diptera* which end in 1—3 bristles, curved at the tip: the abdomen ends in a tubercle furnished with a process directed downwards and protecting the genital organ: on each side are two long cottony threads secreted by the spinnerets, accompanied by several rather long hairs around which this cottony matter adheres.

The following subdivisions of this sub-family are suggested by Signoret or by his descriptions:—

1. *Lecaniodiasparia*:—Species having the shield-like form of the *Diaspina* and the anal lobes and lower lip of the *Lecanina*: inclosed in a complete sac or envelope: adult ♀ without legs or antennæ or the latter only represented by stumps: the ♀ after laying her eggs within the envelope shrivels up towards the head: young sometimes viviparous.

2. *Signoretiaria*:—Similar to the preceding, but legs and antennæ present in the adult ♀.

3. *Ceroplastaria*:—Species in which the adult ♀ is covered with a waxy layer having the tesselated appearance of the carapace of a tortoise.

4. *Pulvinariaria* :—Species in which the body is naked, but secretes a cottony mass in which the eggs are laid.

5. *Lecaniaria* :—Species in which the body is naked and there is a secretion : often viviparous.

Subdivision LECANIO-DIASPARIA.

Lécaniodiaspites, Sign., A. S. E. F. (4 sér.) x, p. 273 (1870) ; *Lecanodiaspis*, (5 sér.) i. p. 422 (1871).

Lecanio-diaspidæ, Maskell, Trans. New Zeal. Inst. xi, p. 205 (1879). *Lecanio-coccidæ*, pt., ibid, xiv, p. 223 (1882).

This group includes those genera in which the adult ♀ is without legs or antennæ and is inclosed in a sac or envelope with a fringe around the body more or less visible but always present : the upper portion of this envelope appears to be formed by the larva and the lower portion by the adult insect : the ♀ lays her eggs within this envelope and to make room for them shrivels up towards the head so as to be hardly visible : the young are sometimes viviparous. The group forms a link between the *Diaspina* and the *Lecanina*, having the shield-like form of the first and the under-lip and abdominal lobes which characterise the second.

1. The apodous adult ♀ inclosed in a firm, globular, irregular, shell, to which it is not attached : the young insect instead of the abdominal lobes of *Lecanium* has the anal tubercles of a *Coccus* : the under-lip of the larval ♀ is 2-jointed :—*Pollinia*, Targ. [Sign., l. c. x, 274.]

2. Shell or envelope more or less flat or convex, firm, and with a regular double fringe around the naked body and on the dorsum a number of tubiform spinnerets secreting a matter isolated like the tubes but together forming a complete envelope : under-lip 1-jointed : *Asterolecanium*, Targ. [Sign., l. c. 276].

3. Shell almost smooth, compact, spherical above, flat beneath, felted, with a well-developed fringe : adult ♀ without feet, antennæ completely atrophied, their place occupied only by circular rings : anal tubercle always present and for this reason Maskell makes it the type of a new subsection *Lecanio-coccidæ* :—*Planchonia*, Sign. [l. c. 282].

4. Similar to *Planchonia* without feet, but with the antennæ present thus connecting with the next group :—*Lecaniodiaspis*, Targ. [Sign., l. c. 285].

5. Maskell [Trans. New Zeal. Inst. xi, p. 208, 1879] subsequently created a genus for an insect in which the young have the abdominal lobes; the shield is glassy and transparent, becoming waxy at a later period and, in one species, felted at the latest stage : the ♀ preserves the feet and antennæ at least until after the young are produced :—*Ctenochiton*.

6. To these add a genus created by Maskell for species in which the adult ♀ has a shield formed partly of the pellicle of the second moult and partly of a firm, apparently chitinous secretion: apodous in the adult stage:—*Lecanochiton*, Mask. [Trans. New Zeal. Inst. xiv, p. 221, 1882].

Subdivision SIGNORETIARIA.

Signoret, A. S. E. F. (5 sér.) i, p. 422 (1871).

This group includes species inclosed in a kind of sac or envelope formed by the female at the time of laying her eggs and intended for their protection: this sac varies much in character being in some a mere cottony mass, and in others firm and felted: feet and antennæ present, sometimes atrophied.

1. Species inclosed in a rather thick or felted case formed of a white substance: antennæ 8-jointed in the adult, 6-jointed in the larval ♀:—*Signoretia*, Targ. [Sign., l. c. 426].

2. Species enclosed in a complete envelope or sac in which the adult ♀ is found lying on a cottony mass, its body shrivelled and pushed to one of the extremities in proportion to the number of the eggs: the larval and adult ♀ have 6-jointed antennæ, but the feet and antennæ become atrophied, thick and short, and the joints are scarcely visible: adult ♂ with 10-jointed antennæ: six eyes, two in front of the vertex, two a little beneath and two in place of the rostrum:—*Eriopeltis*, Sign. [l. c. 429].

3. Species inclosed in a sac of a white felted substance: anal ring round in front and behind and with eight hairs on the recurved extremity: antennæ of ♀ with six joints in the larval, pupal, and adult states. *Philippia*, Targ. [l. c. 433].

Subdivision CEROPLASTARIA.

Sign. A. S. E. F. (5 sér.) i, p. 423 (1871).

This division includes those species which are covered by a layer more or less thick of a waxy substance that forms in some a covering resembling the carapace of a tortoise and in others one resembling a star-fish. It includes the genera *Vinsonia* and *Ceroplastes*, the former of which combines the tortoise-shaped disc of the dorsum with star-fish limbs, whilst the latter is without arms. From Signoret's remarks [l. c. iv, p. 98, 1874] we should place here the genus *Fairmairia*, Sign., to contain species having a scaly covering of a mother-of-pearl consistence in the form of a tent or of two leaves leaning against each other; composed of a circular-rayed secretion that increases in concentric circles formed each below the other. The larva is flat, twice as long as broad; as it grows it becomes higher than broad, but still keeping its elongated form; 2½ times as long as broad, very convex above and flat beneath: it preserves its limbs and antennæ, which are 6-jointed in the larva and 8-jointed in the adult.

Genus VINSONIA, Signoret.

A. S. E. F. (5 sér.) i, p. 423 (1871); ii, p. 33 (1872).

Insects in which the pellicle covering the body is of a waxy appearance, corneous, transparent, forming on its disc a tortoise-like tessellation and having seven rays or arms, one corresponding to the head and three on each side corresponding to the stigmata, with a very short one at the anal extremity. The insect beneath is oval, strongly rounded, a little narrowed towards the head: antennæ 6-jointed, of which the third joint is longest and equal to the last three taken together; the sixth is longer than the fourth and fifth and has some hairs; there are two hairs on 1, 2, and 5: rostrum 1-jointed, short: feet slender and short, tibiæ as long as the tarsi.

VINSONIA PULCHELLA, Signoret.

A. S. E. F. (4 sér.) x, t. 7, f. 7 *a—d* (1870); 5 (sér.) ii, p. 34 (1872).

The ♀ has the appearance of a 7-branched star, and, as it grows older, the secretion fills up the space between the branches of the star, which appear then to be united by a membrane: the disc of the dorsum is convex and semi-globose. This species has been found on the mango in Réunion.

CEROPLASTES, Gray.

Spicil. Zool. p. 7 (1830): Walker, Cat. Hom. B. M. iv, p. 1086 (1851): Sign., A. S. E. F. (5 sér.) i, p. 424 (1871); ii, p. 35 (1872); Comstock, Rep. Agr. U. S. p. 330 (1880).

Species covered with a thick waxy matter which does not adhere to the insect, and which is formed of layers of secretions from the spinnerets. Some of the species have on the dorsum tubercles or tumescences varying in size according to age and which disappear more or less as the insect reaches its full growth, then from being more or less flat with concentric lines and tumescences it becomes globular and smooth: antennæ 6-jointed, of which the third joint is the longest: in the larval stage the fourth and fifth joints appear as one: legs long, tibiæ as long as the tarsi: claw with four digitules, the shorter pair very stout and horn-shaped: ♂ unknown.

CEROPLASTES CERIFERUS, Anderson.

Coccus ceriferus, J. Anderson, Mon. Coccus cerif., Madras, (1791); Corres. Madras, p. 46 (1800): Pearson, Phil. Trans. p. 383 (1794); Fabricius, Ent. Syst. Sup. p. 546 (1798); Syst. Rhyng. p. 311 (1803): Chavannes, A. S. E. F. (2 sér.) vi, p. 144 (1848): Walker List Hom. B. M. iv, p. 1087 (1851).

Columnea ceriferus, Targioni, Atti Georg. (1866).

Ceroplastes ceriferus, Westwood, Gard. Chron. p. 484 (1853): Sign. A. S. E. F. (5 sér.) ii, p. 40, t. 7, f. 3 (1872). J. Wood-Mason, Journ. Agri.-Hort. Soc. India, 1878, v, p. 76.

Insect globular, a little elongate, covered with a white waxy mass; the part resting on the food-plant more or less convex. Found on *Celastrum ceriferum* in Madras: on the kowa or arjoon, mango, pipul, and other trees in Ranchi, Chutiá Nagpur.

Subdivision PULVINARIARIA.

Pulvinariæ, Maskell, Trans. New Zeal. Inst. xi, p. 205 (1879): Sign., A. S. E. F. (5 sér.) i, p. 424 (1871); iii, p. 29 (1873).

This division is formed for the genus *Pulvinaria*, Targ., which includes those species in which the adult ♀ forms a mass of waxy-resinous cottony matter in which the eggs are laid. To this genus belongs the *P. gasteralphe*, Icery, that attacks the sugar-cane in the Mauritius.

Subdivision LECANIARIA.

Sign., A. S. E. F. (5 sér.) i, p. 424 (1871); iii, p. 395 (1873).

This group includes those species which are naked: they vary in form, flat, or globular, or semi-globose and more or less smooth or rugose. It comprises the following genera:—

1. Species which are naked, flat or globular, smooth or rough, with one joint in the lower lip and having anal lobes or scales:—*Lecanium*, Illig. [Sign., l. c. iii, 395].

2. In which the adult ♀ in its most advanced stage is divided into two equal parts by a film formed of the skin of the abdomen which remains stationary, whilst the insect continues to increase on its dorsal surface until the lateral margins thereof meet and a ball-like form is produced on the underside of which traces of a fissure may be seen:—*Physokermes*, Targ. [Sign., l. c. iv, 87].

3. Species in which the ♀ is spherical, more or less rounded, except where it is attached to its food-plant, and the ♂ occur in masses along and around the branches on which the insect lives: formed for the wax-insect of China:—*Ericerus*, Guérin [Sign., l. c. 90].

4. Body convex above and expanded on the margin; cleft posteriorly, lobes obtuse, approximate, inflexed: antennæ short, conical, 6-jointed, three basal joints large, terminal sub-equal, small: feet robust short, tibia hollowed anteriorly to receive the tarsus, which is ovate, acute, furnished with a pointed claw:—*Lecanopsis*, Targ. [Sign., l. c. 93].

5. Differs from the preceding in having neither feet nor antennæ in the adult state:—*Aclerda*, Sign. [l. c. 96].

6. Created for the lac-insect of India:—*Carteria*, Sign. [l. c. 101]: *see* A. M. N. H. i. p. 10 (1861) for Carter's description.

LECANIUM, Illiger.

Sign., A. S. E. F. (5 sér.) iii, p. 395 (1873).

Signoret includes in this genus species which are naked, more or less flat or globular, smooth or rugose: lower-lip with a single joint: abdomen cleft at the anal extremity and with two triangular lobes or scales above the cleft.

Signoret has divided the genus, which is numerous in species, into six sections or sub-genera:—

1. Insect flat; segments of the body distinguishable; usually viviparous: antennæ in adult ♀, 7-jointed; in larva, 6-jointed:—*L. hesperidum*, Linn.

2. Insect more or less elevated, but elongate, and some having a kind of dorsal ridge: usually oviparous: ♀ ordinarily with 7-jointed and sometimes 8-jointed antennæ, larva with six:—*L. persicæ*, Fabr.

3. More or less elevated, globose, hemispherical; skin of a peculiar tessellated structure: antennæ in ♀, 6—7-jointed. *L. aceris*, Schrank.

4. More or less globose, hemispherical; the skin is perforated with oval cellules or openings; tarsi jointed; antennæ in ♀, 8-jointed. *L. coffeæ*, Walker.

5. In which the skin is rugose and the dorsal disc has one longitudinal and two transverse ridges and is marked by a more or less irregular pattern formed of cellules or openings: antennæ usually 8-jointed.—*L. depressum*, Targ.-Tozz.

6. Entirely globular except the part attached to the food-plant: antennæ and feet wanting:—*L. emerici*, Planchon.

LECANIUM HESPERIDUM, Linn.

Coccus hesperidum, Linn. Syst. Nat. ii, 739 (1735): Fabricius, S. R. (1803).

Calymnatus hesperidum, Costa, Nuov. Obser., t. i, f. 1? (1835).

Calypticus hesperidum, Costa, Faun. Ins. Nap. 8, 1 (1837): Lubbock, Proc. Royal Soc. ix, p. 480 (1858); A. M. N. H. (3 sér.) iii, p. 306 (1859): Beck, Trans. Micr. Soc. (n. s.) p. 47 (1861).

Lecanium hesperidum, Sign., A. S. E. F. (4 sér.) viii, p. 856 (1868) ; (5 sér.) iii, p. 399 (1873) : Maskell, Trans. New Zeal. Inst. xi, p. 205, t. 6, f. 12 (1879) ; xii, p. 292 (1880) : Comstock, Rep. Dep. Agr. U. S. p. 44, f. 52 (1876) ; p. 335, t. 8, f. 2 (1880).

Young insect flat, long, oval, reddish-brown, very active ; abdominal cleft visible : antennæ with six joints, the third longest, the fifth having the appearance of two soldered together, the last with a few hairs : tibiæ and tarsi of about equal length ; the upper pair of digitules long, the lower short and narrow : the abdominal lobes end in two very long setæ. The adult ♂ is not known.

Adult ♀ oval, varying in eccentricity from a regular ellipse to nearly circular, elongate, flat ; yellow, inclined to brown on the disc, often dark ; smooth, shining, with a fringe of small hairs not very close together, sparingly punctured on the disc ; after death, the border above becomes wrinkled radially for a narrow space. The antennæ are present and are 7-jointed, 1 and 3 joints thickest, 4 and 7 sub-equal in length, and 3 a little shorter, rest shorter and sub-equal. Feet moderately long, coxæ thick, femora moderately large and about the same length as the tibiæ, which are thinner ; tarsi still thinner, ending in a claw : upper digitules rather long, ending in a knob ; lower pair about twice as long as the claw and very broad.

Maskell notes that beneath the body there is a deep red cavity between which and the food-plant to which the ♀ is attached the young run about. Abdominal lobes cordiform, more distinguishable in the young insect : anal ring surrounded by six long hairs. Long, 3—4 millims.

This species occurs on holly, ivy, ilex, and especially on the orange, and has been found throughout Europe, the United States, and New Zealand, where it does great damage, but varies much in its appearances, being in some years particularly numerous and destructive and in others much less active. The more common parasites of this species in the United States are *Coccophagus cognatus*, *Comys bicolor*, and *Encyrtus flavus*.

LECANIUM COFFEÆ, Walker.

Lecanium coffeæ, Walker, List Hom. B. M. iv, p. 1079, (1852) : Nietner, Enemies coffee-tree, p. 6 (1861) : Targioni-Tozzetti, Cat., p. 37 (1869) : Signoret, A. S. E. F. (4 sér.) viii, p. 849, t. 1, f. 16 *a*, (1868) ; (5 sér.) iii, p. 435, (1873).

This is the 'brown scale-insect' or 'brown or scaly-bug' of writers. Walker (l. c.) describes it simply as "ferruginous, flat, scale-like, almost round, with transverse ridges : long 2 millims," and remarks that it destroys the Coffee plantations in Ceylon. ♂. Clear light pinkish colour, slightly pubescent: head transversely ovate-rotundate, narrowed, and angular in front; eyes large, black; ocelli two, small, lateral; antennæ 9-jointed, the second joint smallest, third longest, thence decreasing to the tip. Thorax ample, cordiform, narrowed in front: wings two, hyaline, with two veins, of which the subcostal vein is dark pink, not folded straight down the back when at rest, but half spread out: scutellum ample, transverse, rounded at the apex. Abdomen triangular-subcylindrical, of shrivelled appearance, with two lateral points, one central appendage, and two long, thin, white filaments at the extremity.

♀. Apterous, tortoise-like, yellowish, marbled with grey or light brown, sub-oval, more or less semi-globose according to age, dorsum with one elevated longitudinal and two transverse ridges, uneven: cleft behind, at the extremity of a split bifid, anal flap or lobe of a brown colour: eyes marginal, black: antennæ 7-jointed, the third joint longest: the rostrum with one long sucking bristle. Old individuals are light brown with a dark margin, smooth, semi-globose, fixed to the branch.

Larva of ♀ has two anal filaments, which are lost when the insect undergoes the final moult. The larva and pupa in ♂ and ♀ are active, except the pupa of the ♂, which is plentiful on the underside of the leaves, where the long narrow oval shell under which it rests is easily discovered: this shell is transparent and composed of nine plates of which three are central and three are on either side. Sometimes the entire underside of the leaves is covered with nothing but the pupa of the ♂ all dead. The eggs are oval and of a pinkish colour and are not actually laid by the ♀, but when they are matured the parent dies, her whole interior forming one mass of eggs protected by the shell. The above is Nietner's description of the form found in Ceylon. Signoret describes specimens from Bahia thus:—Brown-red, hemispherical, margins a little flattened: antennæ 8-jointed, third joint longest, 4 and 5 equal, 8 longer than the two preceding taken together: feet long, tibiæ one-third longer than the tarsi, which are articulated: claw very stout, the two lower digitules horn-shaped: anal ring with eight very long hairs, above on the abdomen six hairs, two on each segment at the tip: the stigmatic hairs of the margin very long, very obtuse at the tip and accompanied by two very short ones; the hairs of the circumference obtuse at the tip, greatest length, 2½; broad 1½ millims. This insect is found on coffee, tea, orange, *Gardenia*, and many jungle trees.

The brown scale-insect is also infested by Hymenopterous insects, perhaps more than the white scale insect or the black scale. These parasites are very minute and are for the most part of a brilliant metallic blue or green or gold.

LECANIUM NIGRUM, Nietner.

Enemies of Coffee-tree, p. 9 (1861). The black scale.

♀. Shield-like, much larger than the brown scale, colour from yellowish grey to deep-brown and almost black, according to age: sub-oval, dorsum with one longitudinal and two concentric oval costæ on the disc, towards the margin slightly rugose. The scale under the microscope is highly tesselated and the anal slit and flap as in *L. coffeæ*: in old ♀ the scale is black with a slight longitudinal costa.

The larva has two long, black, anal setæ and a projectile tube. ♂ scarcely differs from that of *L. coffeæ*, the head and thorax are not so bright in colour, but the wings appear more strongly hyaline. Mr. Nietner remarks that this species occurs alone and in company with the brown scale but is far less common, and Mr. Green notes its occurence on *Chinchona officinalis* and *calisaya*, *Manihot ceara*, and *Croton tiglium*. It is found with *L. coffeæ* on the coffee-tree, but only in small numbers.

Trisporium gardneri, Berkeley: *Syncladium nietneri*, Rabenhorst.

Mr. Nietner remarks that when the scales have been fairly established upon a coffee-tree, the tree becomes covered with a fine black tissue formed of a fungus (*T. gardneri*), which comes and goes after the scale and never alone. At first this fungus has the appearance of a thin, diluted blackwash, but, rapidly increasing in density, within two or three months it quite covers and blackens the leaves and other parts of the tree, finally almost resembling moss. Its period of growth seems to extend over about twelve months, when it is replaced by a young growth or both it and the scale abandon the tree, and when leaving the tree, the fungus peels off in large flakes. Mr. Nietner writes:—‘As the occupation of a coffee or any other tree (by scale-insects), gives rise to the appearance of a glutinous saccharine substance (honey-dew, which is either a secretion of the scale or the extravasated sap that flows from the wounded tree, but more probably a combination of both) which disappears with the scale, and as the fungus does exactly the same, I have no doubt that its vegetation depends upon this glutinous saccharine substance." Whether Mr. Nietner's remarks regarding the appearance of the fungus be correct or not, its occurrence with species of *Lecanium* is marked in the United States, Europe (?), and New Zealand. Mr. Maskell particularly notices that plants attacked by insects of this sub-family have their leaves much blackened.

Subfam. COCCINA.

Coccides, Sign., A. S. E. F. (4 sér.) ix, p. 102 (1869); (5 sér.) iv, p. 546 (1874).

♀ varying in form and in the substance of the skin or covering: in the last stage generally inclosed in a sac or envelope secreted at the time of laying the eggs and which is cottony in *Dactylopius*, *Coccus*, &c., felted in *Eriococcus*; globose and more or less scaly or corneous in *Kermes*; calcareous in *Margarodes*; or it is naked and reclines on a cottony cushion as in *Nidularia*. The under-lip is 2—3-jointed: abdominal lobes or plates are absent, but on each side of the abdomen at the anal extremity are tubercles which carry a more or less long bristle. The segments are easily visible in the larva, less so in the adult; each segment has on each side one or more spinose appendages: antennæ vary much in the number of joints, usually six in the larval state and 6—10 in the adult: legs as in all the *Coccidæ*. In the adult ♀ one can find, by maceration in caustic potash, the antennæ sometimes deformed, the feet, but sometimes these are wanting, and the lower-lip always. The ♂ only differ from the ♂ of the sub-family *Lecanina* in the shorter armature: they are small, with long antennæ, generally 10-jointed, filiform, pubescent; four eyes and usually ocelli: wings large, membranous, transparent: halteres 3-jointed: femora long, pubescent; tarsi one-jointed, one-clawed, usually with four digitules: abdomen more or less long and broad with a bundle of hairs on the last segment, whence proceed 2—4 very long threads formed of a white, fragile secretion.

The following subdivisions are suggested in this subfamily:—

1. Species having the globular shape of some forms of *Lecanium* and easily taken for them, but with a multiarticulate under-lip and without the Lecanid abdominal lobes in the larva, though possessing them in the adult stage:—*Kermesaria*.

2. Species of an elongate form resembling the genera of the group *Dactyloparia*, more or less pubescent: antennæ 6—7-jointed: an emargination more or less visible at the end of the abdomen between the lobes, which are furnished with 5—6 hairs, of which one is very long:—*Anthococcaria*.

3. Species varying in form and the number of joints in the antennæ, with an anal ring visible, which has 6—8 hairs and spinnerets secreting a cottony matter: tarsi and claws with digitules: 2—4 filamentary processes at the extremity of the abdomen:—*Dactyloparia*.

4. Species without an anal ring and having merely an opening at the end of the abdomen:—*Coccaria*.

5. Species with only a simple ring at the end of the abdomen: antennæ with 11 joints in the adult ♀, and 10 in the ♂:—*Monophlebaria.*

Subdivision Kermesaria.

Sign., A. S. E. F. (5 sér.) i, p. 425 (1871); iv, p. 547 (1874): Comstock, Rep. Dep. Agr. U. S. for 1880, p. 337.

This group has been formed for the genus *Kermes*, which connects the *Coccina* with the *Lecanina.* At first sight the insect hardly appears to differ from the sixth group of the genus *Lecanium* (p. 281), but is differentiated thus:—Body globular more or less complete or slightly truncate: in the larval state the presence of a more than one-jointed under-lip, the absence of the abdominal lobes or plates and the presence of more or less marked tubercles at the extremity, distinguish them. In the adult state, the antennæ and feet still remain almost normal, but in some species, which have reached the last stage of their life and have secreted their corneous envelope, the antennæ are sometimes deformed and the feet are sometimes absent, and the abdominal lobes resemble those of *Lecanium.* The species of the genus *Kermes* hitherto recorded have been found in Europe and the United States.

Subdivision Acanthococcaria.

Acanthococcites, Sign., A. S. E. F. (5 sér.) v, p. 16 (1875).

This group contains those genera in which the species have an elongate form more or less pubescent, but much less so than in *Dactylopius:* antennæ 6—7-jointed; an emargination more or less visible between the lobes of the extremity of the abdomen and these lobes with 5—6 hairs, of which one is very long. In the larval state all are the same and have on the lateral margins a fringe of spiny hairs, and in some genera on the median line also. The following gives Signoret's table of the genera [l. c. p. 16].

1. Adult ♀ without legs or antennæ: rostrum arising from a curious tubercle or protuberance on the head: body resting on a cottony mass which extends beyond and covers its margins. The ♂ undergoes its changes in a small cottony envelope: antennæ 6-jointed: wings with a very small lobe near their insertion: halteres with a single bristle: head with 4—6 ocelli. Larva with 6-jointed antennæ in ♀, 7-jointed in ♂: adult has the dorsum covered with a transparent waxy and knobbed secretion:—*Nidularia*, Targ. [Sign., l. c. p. 17].

2. Adult ♀ with legs and antennæ: rostrum not arising from the usual place between the first pair of feet, without a tubercle: body

surrounded with a white cottony substance covering all except the dorsal disc :—*Gossyparia*, Sign. [l. c. p. 20].

3. Adult apodous, antennæ in form of a short many-jointed stump, body elongate, cylindrical, thrice longer than broad : rostrum in young with a 2-jointed under lip : anal ring large, in form of a broad circle, finely punctured and striated transversely, with six hairs not extending beyond the abdomen :—*Antonina*, Sign. [Sign., l. c. p. 24 : includes ? *Laboulbenia*, Licht., M. T. Schwer. Ent. Ges. v, p. 299, 1878].

4. Adult in most advanced stage with only last pair of feet, antennæ absent : body globular, rounded ; abdomen not visible ; a very great mass of white cottony matter secreted by the insect and forming an appendage :—*Capulinia*, Sign. [l. c. p. 27].

5. Species enclosed in a simple felted envelope and preserving the members during all stages of their existence : antennæ in ♀, 6-jointed ; in larval ♂, 7, and in adult ♂ 10-jointed :—halteres with a simple bristle : style very short : knobbed hairs on some of the joints of the antennæ :—*Eriococcus*, Targ. [Sign., l. c. p. 29].

6. Species enclosed in an envelope which is pointed at both ends and of a greyish-yellow : *Acanthococcus*, Sign. [l. c. p. 34].

7. Species naked until fully grown, then the ♀ forms a dense sac of waxy matter within which the eggs are laid : the full-grown ♂ makes a similar sac or envelope within which it undergoes its last metamorphosis ; antennæ of larva and adult ♀, 7-jointed : anal ring with eight hairs : four digitules :—*Rhizococcus*, Sign. [l. c. p. 36 : Comstock, Rep. Dep. Agr. U. S. for 1880, p. 339].

8. Add perhaps species in which the adult ♀ has the body egg or pear-shaped, not depressed, covered with a waxy envelope : antennæ and feet absent : rostrum very short, conical, not jointed : anal segment semiglobose, rest of the body of a more firm consistence and furnished with an anal chitinous cone emitting a long, hollow filament formed from the secretion : larva with 6-jointed antennæ and feet :—*Xylococcus*, Löw [Verh. Zool. Bot. Ges. Wien. xxxii, p. 274, 1882].

9. Also add species in which the adult ♀ is inclosed in a sac elliptical in outline, very convex above, formed of a continuous waxy secretion : ♀ itself elliptical, with neither legs nor antennæ : two anal tubercles : anal ring with eight spines : under-lip 2-jointed :—*Cerococcus* Comstock [Rep. Dep. Agr. U. S. 1881-82, p. 213].

10. Add also a species forming a connecting link between the *Coccina* and the *Phylloxera* group of the *Aphidæ* having the head, thorax, and abdomen reunited as in the latter : ♂ entirely apterous :—*Ritsemia*, Licht. [Compt. Rend. Ac. Sc. France lxxxviii, p. 870, 1879].

Subdivision DACTYLOPARIA.

Dactylopites, Sign., A. S. E. F. (5 sér.) v, p. 305 (1875).

This group contains those species in which the genital ring is visible and has 6—8 hairs, and spinnerets secreting a cottony substance that form a more or less truncated point at the anal extremity of the abdomen between the abdominal filamentary processes of which two or four are also present. On the tarsi and claw are digitules dilated at the tip.

1. Larval ♀ with antennæ having 6-joints, adult ♀ with 8; larval ♂ with 7 joints: four digitules: anal ring with six hairs:—*Dactylopius*, Sign. [l. c. p. 306].

2. Larval ♀ with antennæ having 6 joints, adult ♀ with 9; larval ♂ with 7 joints: only two digitules:—*Pseudococcus* Westw., Sign. [l. c. p. 328: Comstock, Rep. Dep. Agr. U. S. for 1880, p. 345].

3. Larval ♀ and adult ♀ with antennæ having 6 joints; larval ♂ with 7: tarsi without digitules:—*Ripersia*, Sign. [l. c. 335].

4. Larval ♀ with antennæ having 6 joints; adult ♀ and larval ♂ with 8: lower lip very short, rostral filaments very short:—*Westwoodia*, Sign. [l. c. 337].

5. Extremity of abdomen with four filamentary processes, no digitules:—*Oudablis* [Sign. l. c. 338; B. S. E. F. (6 sér.) i, p. clvii, 1880: includes *Boisduvalia*, Sign.].

6. Eyes in ♀ prominulous; in ♂ there are twelve, of which four are large, and eight ocelli: no digitules dilated at the tip: eight hairs on the anal ring: two bristles on the halteres: antennæ with nine joints in ♀, ten very long in ♂:—*Puto*, Sign. [l. c. 341, and 395, includes *Putinia*, Sign.].

7. To this may be added the genus *Tetrura*, Licht. [B. S. E. F. (6 sér.) ii, p. lxxv, 183] to contain *C. rubi*, Schranck.

Genus DACTYLOPIUS, Costa, Sign.

Faun. Regn. Nap. Gallins. p. 15 (1835): Sign. A. S. E. F. (5 sér.) v, p. 306 1875: [includes *Diaprostocetus*, Costa, olim].

Antennæ of the larval ♀ with six joints; of the larval ♂ with seven joints; of the adult ♀ with eight joints: six hairs on the anal ring at the extremity of the abdomen: two digitules on the tarsus and two on the claw.

DACTYLOPIUS ADONIDUM, Linn.

Coccus adonidum, Linn., Syst. Nat. p. 740 (1767): Geoffroy, Ins. i, p. 511 (1764): Fabricius, Syst. Ent. p. 743 (1775); Spec. Ins. ii, p. 393 (1781); Mant. Ins. ii, p. 318 (1787); Ent. Syst. iv, p. 224 (1794); Syst. Rhyng. p. 307 (1803);

Gmelin ed. Syst. Nat. i (4) 2215 (1788): Olivier, Enc. Méth. vi, p. 91 (1791): Haworth, Trans. Ent. Soc. i, p. 308 (1812); Bouché, Schädling Gart. Ins. p. 51 (1833): Burmeister, Handb. Ent., ii, p. 74, t. 2, f. 2 (1835): Amyot and Serville, Hist. Nat. Ins. Hém. p. 629 (1843); Walker, List Hom. B. M. iv, p. 1080 (1852).

Pediculus coffeæ, Lederman, Microscop, t. 9 (1762).

Diaprostocetus adonidum, Costa, Prospetto di una &c. (1828).

Trechocorys adonidum, Curtis, Gardiner's Chron. iii, p. 443 (1843).

Coconidia, Amyot, A. S. E. F. p. 476 (1848).

Pseudococcus adonidum, Nietner, Obs. Enemies of Coffee-plant Ceylon, p. 4 (1861).

Dactylopius adonidum, Targioni-Tozzetti, Cat. p. 32 (1868): Signoret, A. S. E. F. (4 sér.), viii, p. 842 (1868); (5 sér.) v, p. 307, t. 6, f. 1, 1*a*, *a d* (1875): Comstock, Rep. Agr. Un. States for 1880, p. 341, t 11, f 1, 1*a-d* (1881).

The species which Signoret assigns to *D. adonidum*, Linn. is described thus:—

♀. Long, 2½—3; broad, 1½ millims. White, a little yellowish: a median dorsal band, brown; feet and antennæ a little brownish, powdered with a large quantity of farinose matter secreted by spinnerets or pores scattered over the entire body: besides this, each lateral lobe or segment presents a secretion which forms a more or less long woolly appendage around the entire body, increasing in length towards the end of the abdomen, where there are four much larger appendages, of which the two internal are the longest and extend to end of, or beyond the body. Antennæ 8-jointed, of which the eighth is the longest, then the third and second, the fourth and fifth are of equal length and shortest, the sixth and seventh a little longer than the fourth and fifth; there is a slight pubescence especially at the tip of each joint. Feet rather long with a rather spare pubescence; tibiæ twice as long as the tarsi; claw stout and long with slender digitules, which are furnished with a very small knob at the tip, abdomen with a more or less distinct and rounded cicatrix on the sutures of the 1-2 segments and the median line; an oblong cicatrix on the sutures of the 5-6 segments on each side nearer the margin than the median line; on each segment a large number of spinnerets in the shape of rounded dots and some scattered hairs. Each lateral lobe presents a space with rounded spinnerets and two more or less stout, conical spines which form the apparatus for secreting the cottony matter of which each lateral appendage is made: those of the lobes of the extremity of the body have a much larger number of spinnerets and the two conical spines are also much larger; a little lower down, two hairs arise, of which one is large, around these is condensed the secretion furnished by the spinnerets. The genito-anal ring is very broad, punctured, and furnished with six rather long hairs.

♂. The larvæ undergo the change in a cottony envelope and their antennæ are 7-jointed. The adult is long of a brown neither yellow nor red, with the segments paler; as it grows older, the colour deepens especially on the head and corneous portions of the pronotum: tegmina long, broadly rounded, of a more or less deep grey, reddish towards the side: halteres long, yellow, with a single recurved bristle at the tip: pronotum long, rounded on the sides, straight in front, rounded behind, with a blackish arch on the mesonotum. Abdomen long, ending in a rounded, thick armature furnished with some hairs: lateral lobes of each segment presents two long filaments of a white cottony substance secreted by a group of rounded spinnerets, in the midst are two long hairs and a smaller, around which the matter secreted is condensed; the lobes above have much smaller ones with but 2—3 rounded spinnerets. Head thick, in the form of a ball or a little truncated in front, more convex beneath than above and pubescent, except on the pigmentary circle of the eyes and ocelli of which there are perhaps four. Feet long, with a broad tarsus, flat, pubescent, presenting a very long and narrow hook or claw; the digitules of the tarsi are not thicker than ordinary hairs and have a very small knob at the tip.

♀. The larva varies in size with its age, is flatter, of the same elongated form and same colour but the antennæ are 6-jointed.

♂. The larva is of a uniform shape but more elongate and the antennæ are 7-jointed. The moult preceding the imago state is often indicated by a rolling up internally of the rostral filaments and sometimes by the future antennæ and tibiæ, the latter of which are already indicated interiorly in the members of the larva. (*Sign.*).

Mr. J. Nietner (*l. c.*) describes the Ceylonese form of this insect as follows:—

♀. Apterous, oval, brownish-purple, covered with a white mealy powder which forms a stiff fringe at the margin (one tooth or tuft to each segment on either side) and at the extremity of the abdomen 2 setæ. The dorsum has three longitudinal and a number of transverse corrugations, the latter corresponding with the number of segments: upon each of the three longitudinal corrugations, the mealy secretion forms a sort of ridge-cap. The antennæ, legs, and rostrum are of a light brown colour and slightly pubescent: the antennæ are setaceous, 8-jointed of which the last joint is the longest, nearly as long as the legs and porrect. The rostrum is situate between the first pair of legs, having a few hairs but no sucking bristles at the tip.

♂. Light sordid brownish, slightly pubescent: head rather square, enlarged behind and rounded off at the posterior angles; eyes prominent, black; ocelli two, small, lateral; antennæ 9-jointed, second joint longest, third shortest, 4—9 subequal: [mouth externally represented by two black knobs, resembling blunted mandibles? these are eyes]. Thorax ample, oblong-quadrate, enlarged at the shoulders: wings two, ample, two-veined, hyaline strongly iridescent, laid straight down the back, half overlapping each other when at rest: scutellum ample, transverse, rounded at the apex. Abdomen sub-cylindrical, of shrivelled appearance, with two long anal setæ, which are slightly curled and of a mealy, brittle consistence, being much smaller than the ♀, about $1\frac{1}{4}$ millims long and in appearance resembles a small may-fly.

♀. Larva or pupa resembles the perfect insect but on a smaller and less perfect scale.

♂. The pupa has the wings and anal setæ rudimental. These imperfect ♂ resemble young *Psoci* or *Aphides* but they carry the antennæ turned backwards along the sides of the body. The larva and pupa are active and can move about.

Nietner (*l. c.*) has the following observations on the *D. adonidum* of Ceylon:—"The insects, in all stages of development, are found all the year round, the propogation being continuous. It appears to me, however, that the ♂ are more plentiful about June and January than at any other season. They affect dry, hot localities, and are found both on the branches and on the roots of the trees to about one foot below the surface of the ground. The eggs are actually laid and enveloped in a white cottony substance and are oval and of a yellow colour." Perhaps there are two species as some are rather flatter and more densely covered with meal, but these may be only local varieties. The white scale-insect attacks orange, guava, and other trees, as well as coffee, and is also found on beet-root and other vegetables. It is also infested by parasites, amongst which Mr. Nietner mentions the occurrence of a small mite named by him *Acarus translucens;* a similar mite is reported from America and New Zealand as infesting the egg-envelope of these insects. Mr. Green writes:—"This insect attacks a large number of plants. Upon coffee it is found chiefly among the clusters of berries, and, in this position, not content with the primary damage done by itself, it attracts a species of ant which builds its nest inclosing the colony of *Dactylopius.* On the estates, it is most destructive to young Chinchona plants, frequently killing them outright. It is preyed upon by the larvæ of several beetles and also by the larva of *Lucius epius*, a small Lepidopterous insect."

Subdivision Coccaria.

Sign. A. S. E. F. (5 sér.) v, p. 346 (1875).

This group is confined to the genus *Coccus*, which includes the cochenille insect, *Coccus cacti* of authors, used as a dye. It has not the anal ring of the previous group, which is here replaced by a simple hairless opening placed at the extremity of the abdomen: eyes smooth, two ocelli: antennæ in the adult ♀ only 7-jointed; larval ♀ with 6 and larval ♂ with 7 joints. The species recorded are from N. and S. America, China, Australia, New Zealand, and Rodriguez island.

Subdivision MONOPHLEBARIA.

Monophlebites, Sign. A. S. E. F. (5 sér.) v, p. 350 (1875.)

This group is formed for those species of the sub-family *Coccina* in which the ♀ has 11 joints in the antennæ and the ♂ has 10 joints; each of these joints has a node or swelling and a whorl of hairs which makes it appear double and has thus led some authors to give 22—25 joints to the antennæ: the eyes are compressed with numerous facettes but there are no ocelli in the ♂: instead of the ciliated anal ring of the *Dactyloparia*, we have a single ring placed before the extremity of the abdomen. The group includes the following genera:—

1. Covered with a cottony matter varying in colour and with a secretion of still larger filaments: two horn-shaped digitules on the claw and two on the tarsus but without knobbed tips: antennæ in ♀ with 11 joints; in larva 6-jointed with a long pubescence: genital apparatus ending in a tube internally with a reticulated ring like a sphincter and without hairs at its extremity:—*Icerya*, Sign. [l. c. 351: Comstock, Rep. Dep. Agr. U. S. for 1880, p. 347].

2. As preceding: the pubescence very long with two knobbed hairs on the last joint of the antennæ: no digitules:—*Guerinia*, Targ. [Sign. l. c. 352].

3. Only nine joints in the antennæ, rest as in *Monophlebus*:—*Drosicha*, Walker. [Sign. l. c. 353: Walker, List Hom. B. M. Sup. p. 306, 1858].

4. Antennæ very long; eyes reticulated: lateral margins of the abdomen in the ♂ without appendages:—*Leachia*, Sign. [l. c. 359].

5. Antennæ with 11 joints in ♀, 10 in ♂: no digitules but simple hairs: lateral margins of the abdomen in the ♂ with rounded tubular appendages: antennæ in ♀ conical, moniliform with a very short pubescence:—*Monophlebus*, Leach. [Sign. l. c. 363].

6. Body covered with a white secretion: antennæ 11-jointed, conical: feet stout, claws short, no digitules: a spare pubescence in form of spines on the inner side of the feet and of hairs on the outer side: teguments with rounded spinnerets mingled with some hairs and light semitransparent spaces:—*Ortonia*, Sign. [l. c. 367].

Adult ♂ piceous black, abdomen and pronotum fuscous flesh-coloured, scutellum whitish: wings piceous with two hyaline-white lines: antennæ very long 25-jointed (?): abdomen flat, incised at the apex, the five last segments emitting on each side a long pilose appendage (increasing in length) (*Westw.*) Body long, 7: last lateral appendage 2: antennæ 8½: exp. teg. 16¾ millims.

Reported from Malabar, Pondicherry.

MONOPHLEBUS SAUNDERSII, Westwood.

Monophlebus saundersii, Westw., Arc. Ent. i, p. 22 (1845): Walker, List Hom. B. M. iv, p. 1089 (1851): Sign., A. S. E. F. (5 sér.) v, p. 367 (1875).

Allied to *M. burmeisteri*, Westw., but much smaller, covered with a white-farinose powder and with the lateral appendages of the abdomen shorter: head, antennæ, feet and dorsum of thorax brunneous-fuscous; sides of thorax and the abdomen testaceous flesh-colour, the latter furnished on each side with four short, hairy, lateral appendages, the basal very small, the apical longer and between them two about one half smaller than the last, wings fuscous, posterior margin dilated, with two hyaline-white lines: genital organ stout, cylindrical, curved, longer than the apical appendages, thicker at the apex and truncated (*Westw.*). Body long, 4—5: exp. teg. 14—15 millims.

Reported from N. India.

MONOPHLEBUS BURMEISTERI, Westwood.

[illegible] a stout [illegible] [illegible]y (a millim. long)

which this [illegible] is [illegible] Westw., Arc. Ent. [illegible] millims.

Reported from India, Java.

MONOPHLEBUS DUBIUS, Fabr.

Chironomus dubius, Fabr., Syst. Antliat. p. 46.

Monophlebus fabricii, Westw., Arc. Ent. i, p. 22 (1845): Sign., A. S. E. F. (5 sér.) v, p. 365 (1875).

Monophlebus dubius, Walker, List Hom. B. M. iv, p. 1088 (1851).

Adult ♂, deep black, shining, margin sanguineous: abdomen black; apex flat, bifid, rufous; lobes with three elongate porrect hairs: wings deep black, with two hyaline-white lines: feet black (*Westw.*).

Reported from Sumatra.

MONOPHLEBUS LEACHII, Westwood.

Monophlebus leachii, Westw., Zool. Journ. ii, p. 452: Arc. Ent. i, p. 22, t. 6, f. 1 (1845): Walker, List Hom. B. M. iv, p. 1089 (1851): Sign., A. S. E. F. (5 sér.) v, p. 365, t. 9, f. 5, 5*a* (1875).

7. Adult ♀ with 11-jointed antennæ; anal tubercles wanting or obsolete: no rostrum but merely an æsophageal opening:—*Cælostoma*, Maskell [Trans. New Zeal. Inst. xii, p. 294, 1880].

Genus MONOPHLEBUS, Leach, Sign.

Monophlebus, Leach: Westwood, Arc. Ent. i, p. 22 (1845); Walker, List Hom. B. M. iv, p. 1088 (1851): Sign., A. S. E. F. (5 sér.) v, p. 363 (1875).

Species in which the ♀ has eleven joints in the antennæ and the ♂ but ten: eyes reticulated: no digitules on the tarsi or claws, the lateral margins of the abdomen in ♂ with tubular rounded appendages [not plates]: antennæ in ♀ conical, moniliform, with a very short pubescence. ♂ with wings having a single vein which bifurcates sending out one branch which follows the costal margin and another which trends towards the middle of the internal margin but does not reach it.

MONOPHLEBUS ATRIPENNIS, Klug.

Monophlebus atripennis, Klug, Burm. Handb. Ent. ii, (i) p. 80 (1835): Westwood, Arc. Ent. i, p. 22 (1845): Walker, List. Hom. B. M. iv, p. 1088 (1851): Sign., A. S. E. F. (5 sér.) v, p. 364 (1875).

Adult ♂ fuscous-black: abdomen, scutellum and base of wings obscurely coccineous, with a somewhat frosted white appearance: antennæ longer than the body, very hairy: wings piceous, with two [illegible]aline-white lines: abdomen flat, hairy, incisions between the seg[illegible] deep, and two flesh coloured, apical, hai[illegible] [illegible]ong with two kn[illegible]bbed hairs (Westw.). Body long, 7½ [illegible]

Monop[illegible] List Hom. B. [illegible] v, p. 367 ([illegible]

Adult ♂ piceous-black; pronotum and abdomen fuscous flesh-colour; scutellum and a band between the wings, whitish: wings broad, piceous, a little paler at the base, and with two hyaline-white lines: antennæ longer than the body: abdomen with five long, hairy appendages on each side. Differs from *M. leachii*, Westw., in its shorter wings, posterior margin more rounded and longer abdominal filaments (*Westw.*). Body long, 5—6: cum teg. 16: exp. teg. 13-14 millims.

Locality unknown but most probably N. India.

The following genera belonging to the sub-family *Coccina* are for various reasons not yet arranged under any group:—*Callipappus*, Guérin; *Porphyrophora*, Brandt; *Margarodes*, Guilding; *Orthezia*, Bosc; *Walkeriana*, Sign.; *Llaveia*, Sign.

Callipappus, Guérin, has the eyes with facettes found in the genus *Monophlebus* and the anterior feet are like the rest: it has numerous fragile filamentary appendages secreted by the two penultimate segments as in *Porphyrophora*. The ♂ has antennæ with 11 joints, sometimes only 10, each joint becoming more and more long from base to tip: eyes with facettes, below them an ocellus: abdomen slightly lobed on the sides: genital organ very long, twisted several times and like a portion of the intestine accidentally protruded: above and at the tip of the 5—6 segment are a number of spinnerets forming transparent fragile filaments in shape of a tuft that extends well beyond the abdomen: feet long, tarsus one-third shorter than the tibia and having at the tip a small supplementary articulation; a single claw with a hair on the inner and outer face: halteres broad and stout with a small hook at the extremity, on the side. The ♀ has 10-jointed antennæ, of which the first is very broad and short, the second as broad as long, and the rest increase in length and diminish in breadth: rostrum a little below the insertion of the first pair of feet, which are like the rest. The single species recorded under this genus comes from Australia [Sign., A. S. E. F. (5 sér.) v, p. 374, 1875].

Porphyrophora, Brandt, has, in the ♂, antennæ moderately long, 9—10-jointed: eyes very large with facettes, touching each other beneath: first pair of feet short; tarsi, tibiæ, and claws not longer than the femora; the claw soldered to the tarsus; the other feet as usual, but no digitules, though all the tibiæ and tarsi have some spiny hairs on the internal margin: 5—6 segments of the abdomen, above and towards the upper margin, have a band or row of spinnerets whence arise a large quantity of light, transparent filaments that form a tuft extending well beyond the abdomen: the latter has at the anal extremity a stout elongate tubercle furnished with a hook-shaped style of which the free portion is fine and long: wings very large: adult ♀ is proportionately much stouter than the ♂ and has no trace of a rostrum: in the larva, the rostrum appears between the intermediate pair of legs. The species hitherto recorded of this curious genus belong to Europe and Asia Minor and include the *P. polonica* and *P. hamelii* which are used for dyeing [Sign., A. S. E. F. (5 sér.) v, p. 377, 1875].

Margarodes, Guilding, includes a curious West-Indian species which is inclosed in a calcareous, nacreous, envelope of such consistence as to be used as a bead for necklaces, hence its vulgar name *perle de terre* [Sign., A. S. E. F. (5 sér.) v, p. 385, 1875]. A species has been recorded from S. India. Specimens of Indian and W. Indian puparia are in Indian Museum.

Orthezia, Bosc. [= *Dorthesia*] has the ♀ apterous and the ♂ winged and eyes with facettes, but varies so much in the different stages of its existence that it is necessary to study the whole series before a particular form can be assigned to its proper stage in the development of the insect. The young larva has 6 joints in the antennæ, the larval

♀ has 7, others have 7 joints, with a sort of scape as in the Hymenoptera, and the tibia and tarsus in one, and the adult ♀ has 8 joints in the antennæ. No species of this genus has as yet been recorded from India; it is described by Signoret [A. S. E. F. (5 sér.) v, p. 386, 1875] and Douglas [Ent. Mon. Mag. xvii, p. 172, 203, 1881] and need not be further noticed here.

Genus WALKERIANA, Signoret.

A. S. E. F. (5 sér.) v, p. 390 (1875).

♀. Antennæ with ten short joints, 2 and 10 of equal length and longest: body in its normal state covered with a great number of yellow hairs mingled with a white, calcareous, lamellar secretion which, when removed, shows the body to be like that of a ♀ of the genus *Monophlebus.* The skin has rows of spinnerets differing as they produce the pilose or calcareous secretion: feet robust, of moderate length and of the usual appearance; claw stout, with a hair on each face; the tarsi one-third as long as the tibiæ which latter are longer than the femora. At the anal extremity before the margin, the genital ring is surrounded by a great mass of large hairs: above on the penultimate segment, are three cicatrices, of which the median is transverse, roundly oval, and the lateral are longitudinal oval.

WALKERIANA FLORIGER, Walker.

Coccus floriger, Walker, List Hom. B. M. Sup. p. 305 (1858).
Walkeriana floriger, Sign., A. S. E. F. (5 ser.) v, p. 391 (1875).

Dark red, elliptical, white above, with a double row of lateral, truncated, yellowish-white, elongated appendages, and with some silky hairs: forepart with some dorsal porrect appendages of the same shape (*Walker*). Long 6—7 millims.

Signoret (l. c.) describes the adult ♀ as forming a many coloured pilose mass, yellow, more or less light, more or less tawny, with white calcareous plates strewn regularly over the upper surface and on the sides of the abdomen: the yellow pubescence is longest and most abundant on the thorax, especially on the median line, which causes the white secretion to be less visible: beneath, the entire body is entirely margined with white plates: abdomen with a slight white efflorescence; segments visible and each more and more emarginate as they approach the tip, the median part of the last segment reascending as far as the basal third of the abdomen with the anal or genital opening, around which is a considerable mass of long hairs. Antennæ blackish, with ten joints of which the first is stout and short, the second and tenth are longest; at the tip of each joint is a circlet of short hairs and there are also some on the disc; at the extremity of the tenth joint there are two long hairs and a number of short ones: feet blackish, rather long.

Reported from Ceylon.

Llaveia, Sign., created for a Mexican species which approaches *Porphyrophora* in the form of the first pair of feet and *Monophlebus* in the number of the antennæ. [A. S. E. F. (5 sér.) v, p. 370, 1875].

Tessarobelus, Montr., created for a species from New Caledonia in 1864, [An. Soc. Linn. Lyon, xi, p. 246, 1864, and Sign., A. S. E. F. (5 sér.) vi, p. 600, 1876].

Dr. J. Anderson, in his 'Letters to Banks' (1786—89), quoted by Signoret, has noticed and named several species of *Coccidæ* from the Madras Presidency, but his descriptions are so meagre and imperfect that but little use has been made of them. Amongst those mentioned by him are the following:—

1. *Coccus chlæoon*, found on the *Aira indica*, and which Signoret would refer to *Dactylopius* [A. S. E. F. (5 sér.) vi, 612, 1876].

2. *C. oogenes*, found on the *Phyllanthus emblica*, *Euphorbia hirta*, *Tinospora cordifolia*, and *Hibiscus populneus* in Madras. Anderson describes this species as purple-red and surrounded by a silky material of which the threads are as fine as those of a spider's web and can be drawn out to several inches before they break: the adult ♀ deposits her eggs in a silken receptacle and had no rostrum: the ♂ is of an amber colour [Sign., l. c. 621].

3. *C. trichodes*, found on the guava, *Anona squamosa*, *Solanum lycopersicum*, and *Hibiscus rosa-sinensis*: Signoret would refer it to *Dactylopius*. The ♀ is inclosed in silken threads which fall off when she deposits her eggs and serve to hold the young on the food-plant: ♂ of an amber colour with two opaque white filaments which are longer than the body; wings uncoloured and transparent, but after a few days slightly crimson: antennæ 10-jointed and on each joint a few hairs: segments of abdomen visible; limbs pubescent [Sign., l. c. 625].

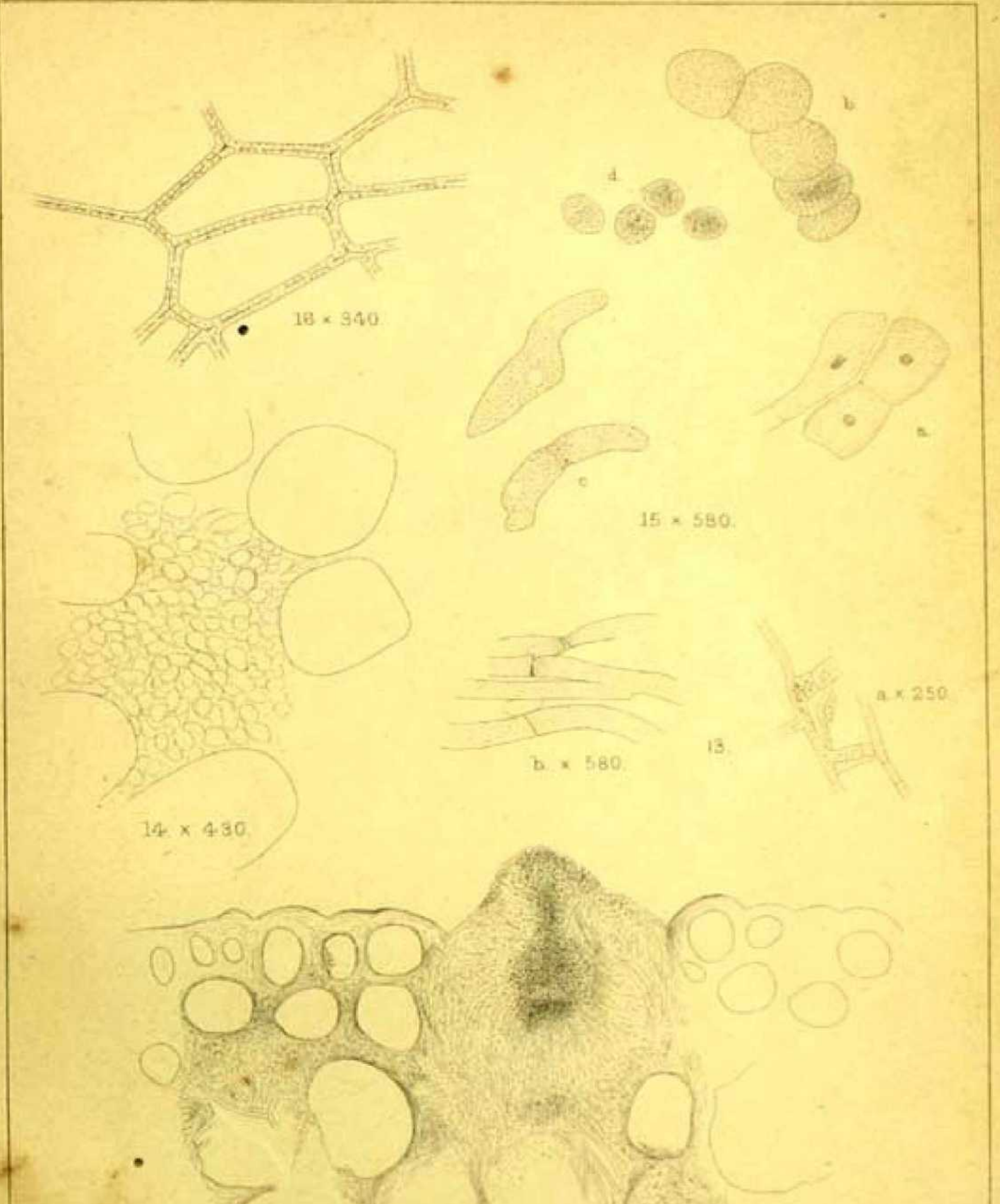
4. *C. erion*, found on the orange, *Robinia mitis*, *Hibiscus rosa-sinensis*, *Ficus indica*, *Erythrina corallodendron*, *Cocos nucifera*, and *Myrtus zeylanicus*: Signoret assigns it to *Dactylopius*: of a purple orange or a chocolate brown. [Sign., l. c. 615.]

5. *C. microogenes*, found on *Vitis vinifera* and *Galega prostrata*. Of a deep red, with a bright white silky covering, the red disappearing in the advanced stage: ♀ with the margins rimmed and becoming sometimes dull grey and sometimes scarlet: ♂ with two wings which when closed are twice as long as the abdomen and two long filaments at the anal extremity. Signoret suggests that this may be the same as *Pulvinaria vitis*, [Sign., l. c. 620].

6. *C. koleoo,* found on the egg-plant. Colour diaphanous white, except the antennæ and the extremity of the rostrum, which are of a chocolate brown: they form a cylindrical silky envelope which becomes attached to the food-plant [Sign., l. c. 618].

7. *C. diacopeis*, found on the *Citrus sinensis:* segments of abdomen deeply incised [Sign., l. c. 613].

8. *C. narcodes*, very sluggish, found on *Odina wodier* [Sign., l. c. 621].



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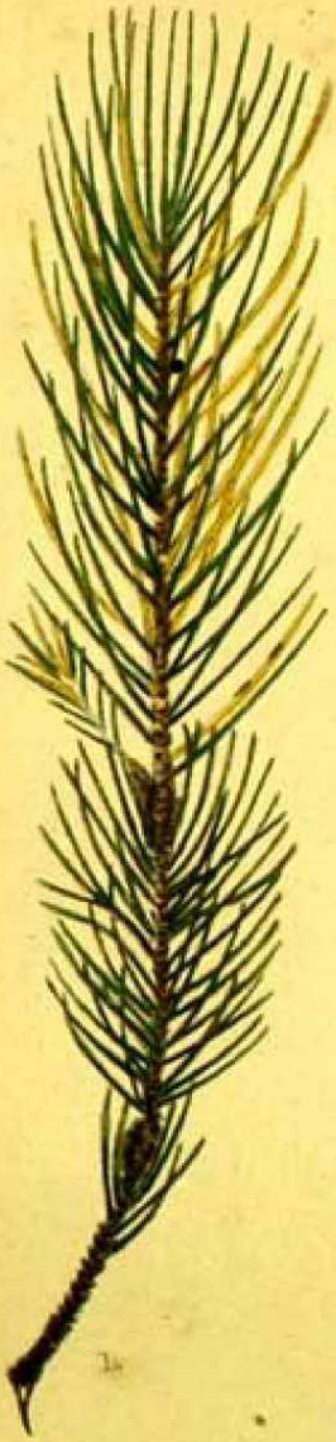

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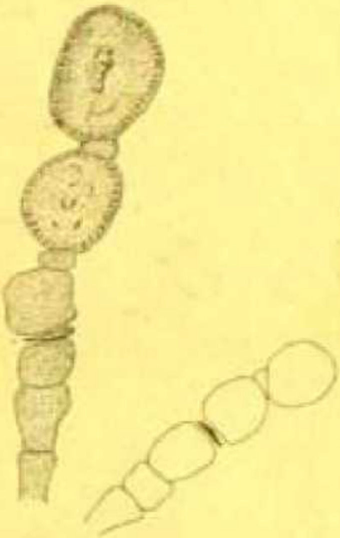

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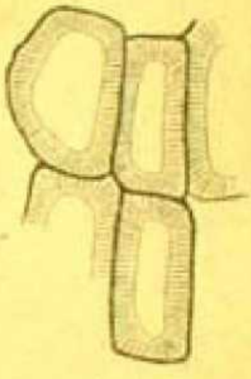

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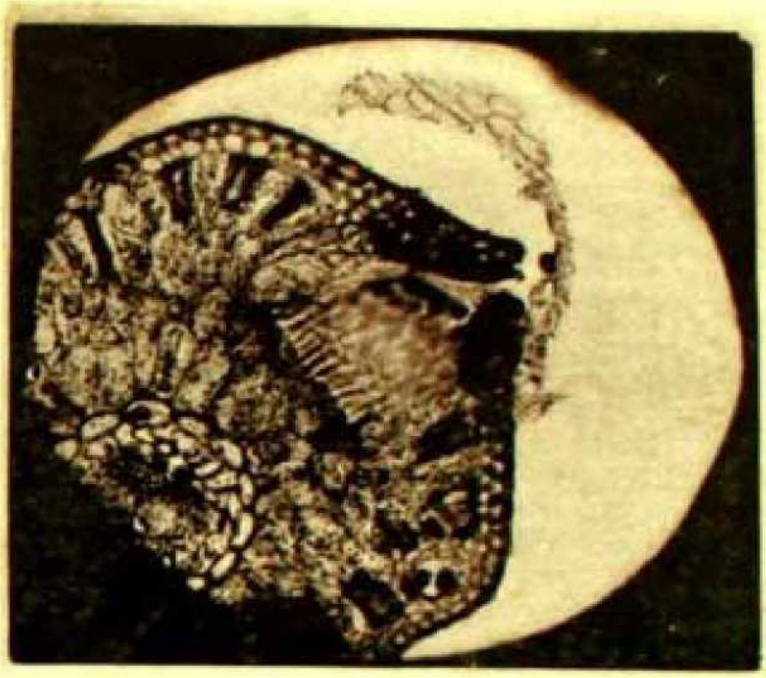

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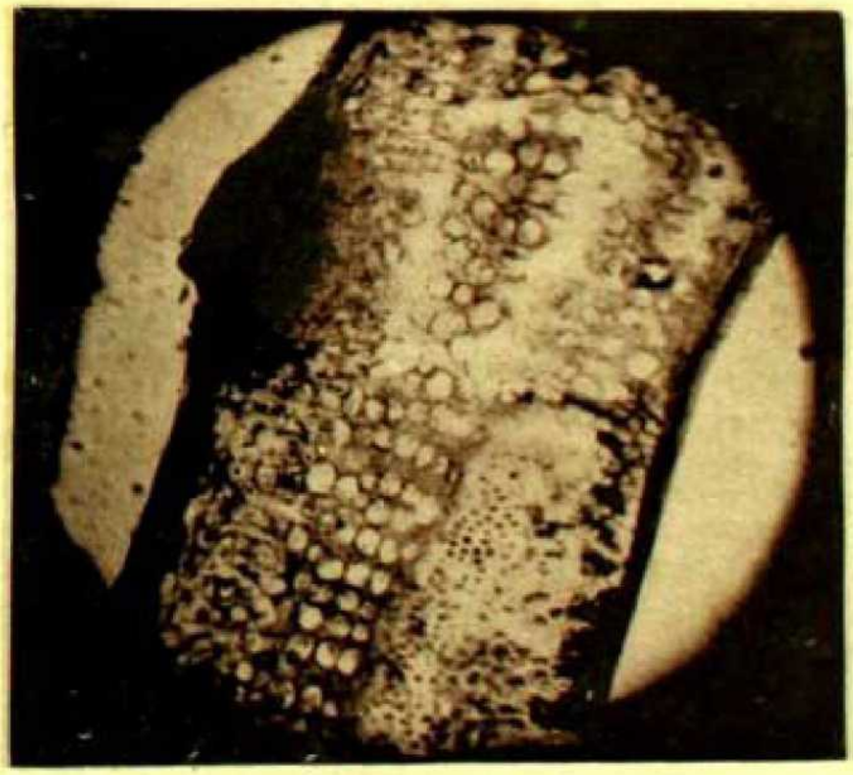

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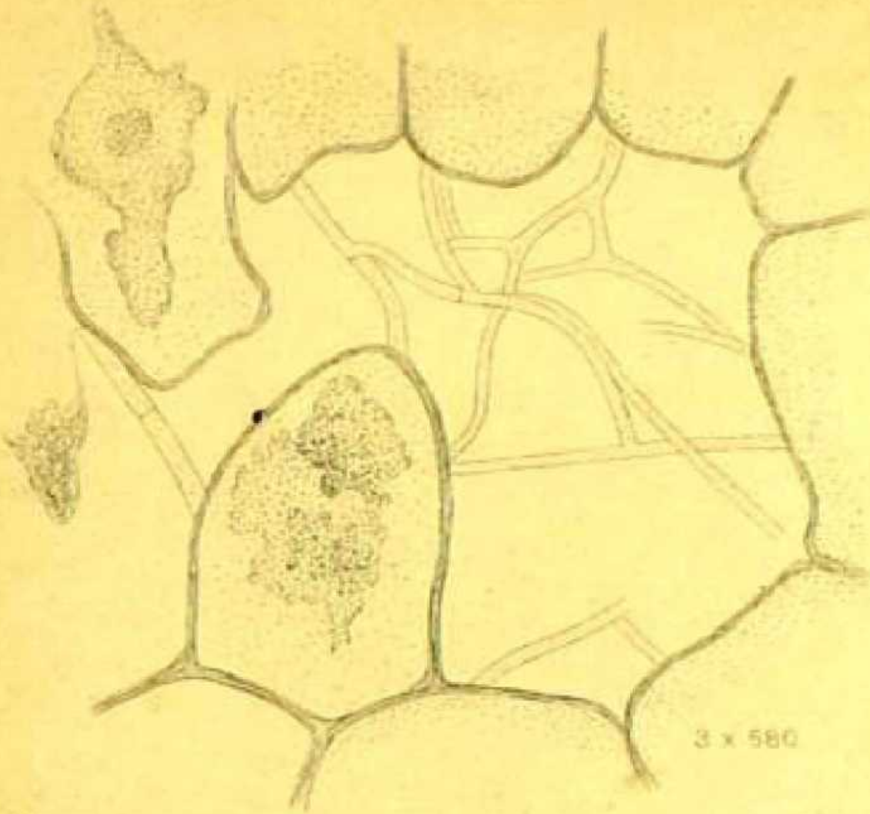
Photo-Collotype. Survey of India Offices, Calcutta. August 1886.



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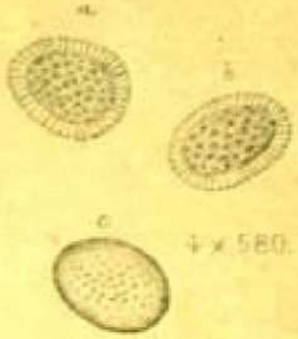

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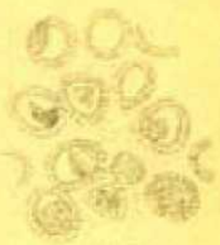

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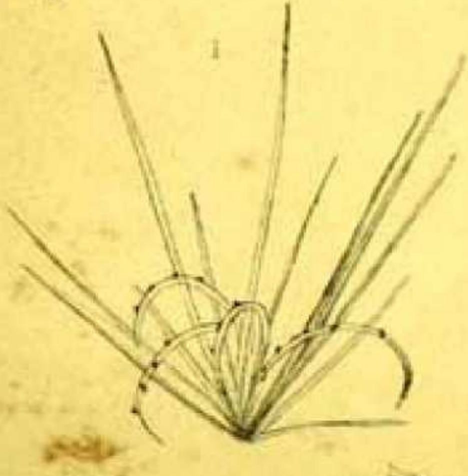

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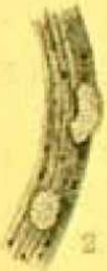

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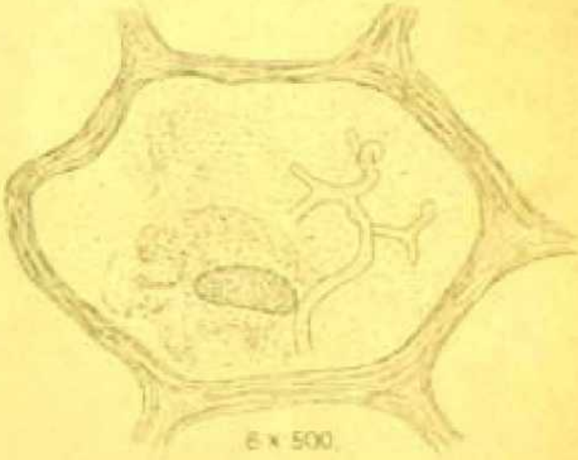

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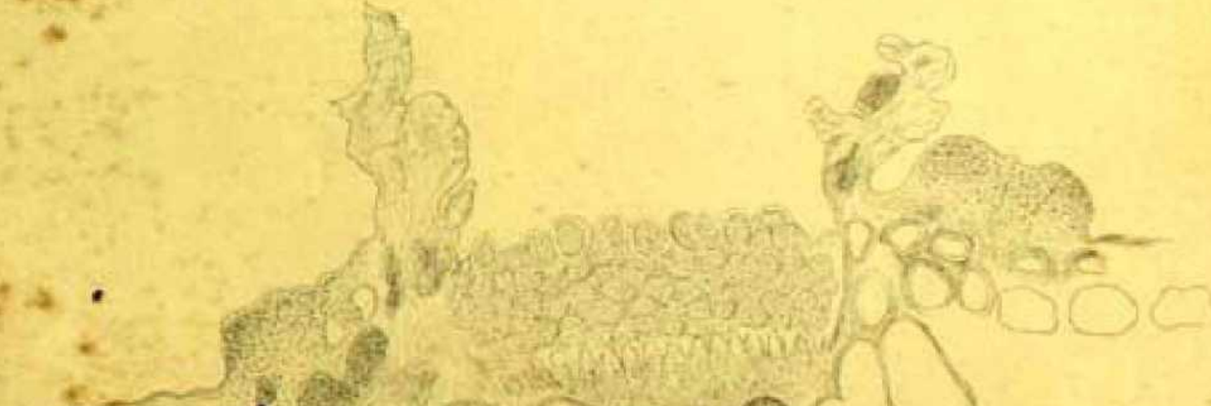

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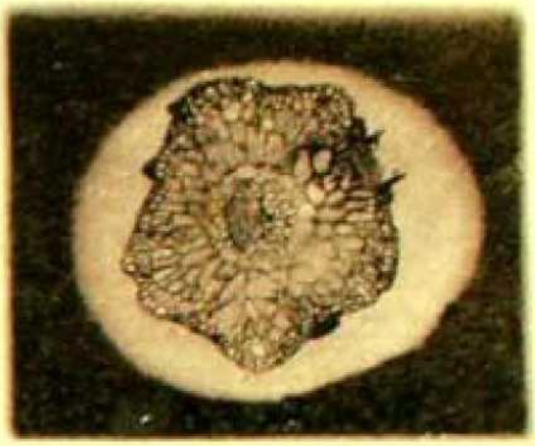
Parker & Coward lith.   Mintern Bros. imp.



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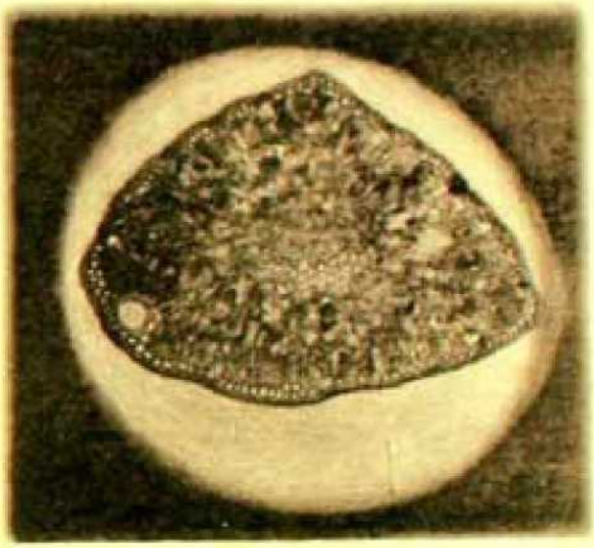

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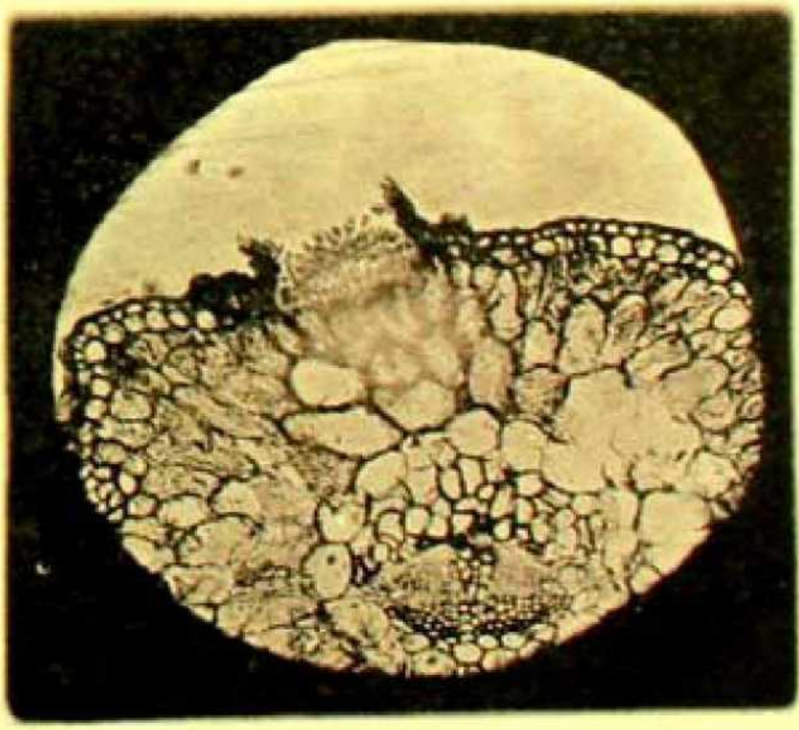

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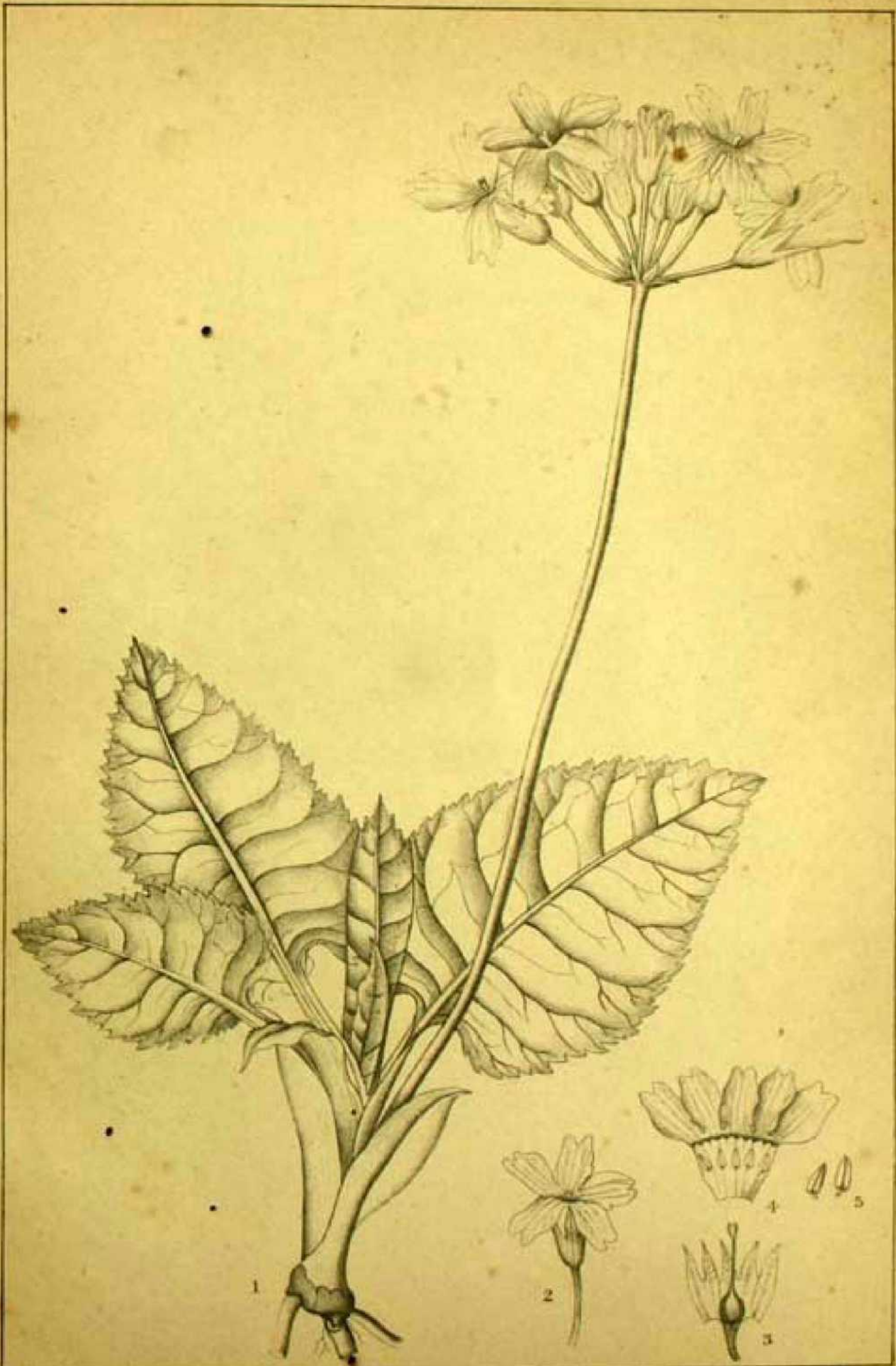
Photo-Collotype.

Survey of India Offices, Calcutta, September 1890.

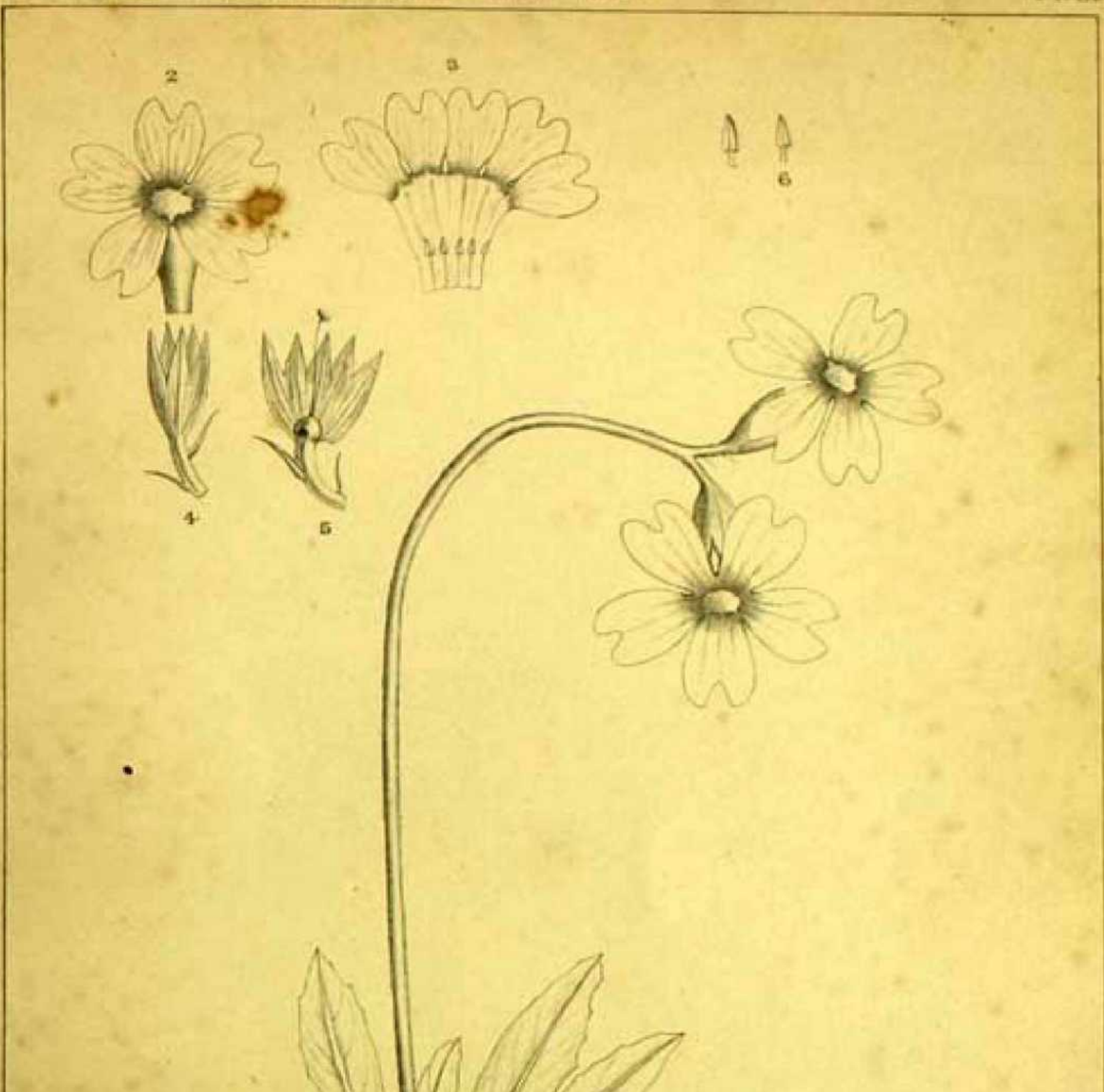
G. KING, Journ. Asiat. Soc. Bengal, 1886, Vol. LV, Pt. II. Pl. VIII.



Parker & Coward lith.
West, Newman & Co. imp.

PRIMULA TANNERI, King.

G. KING, Journ. Asiat. Soc. Bengal, 1886, Vol. LV, Pt. II. Pl. IX.



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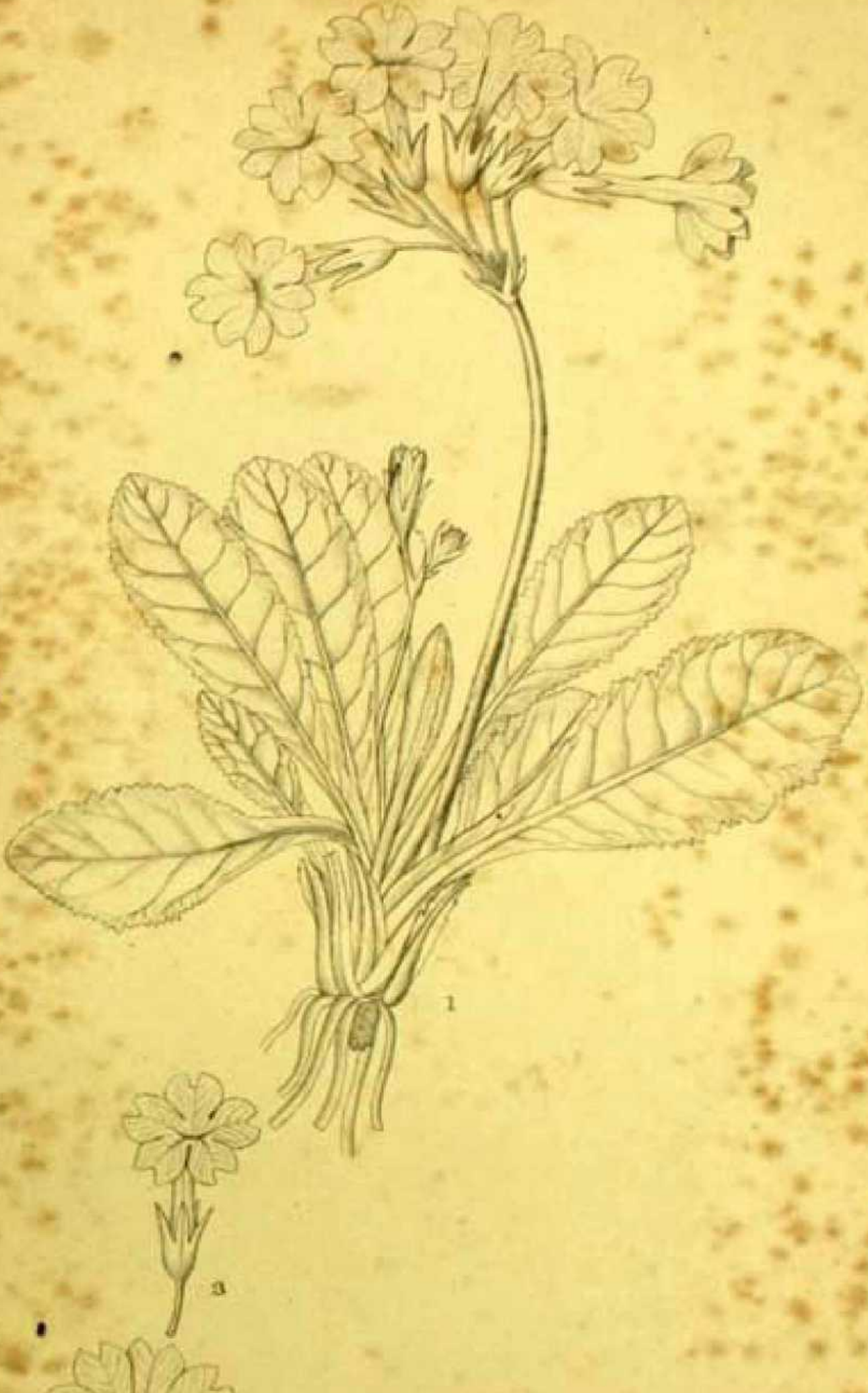
PRIMULA PANTLINGII, King.

G KING, Journ. Asiat. Soc. Bengal. 1886. Vol. LV. Pt. II

Pl. X.



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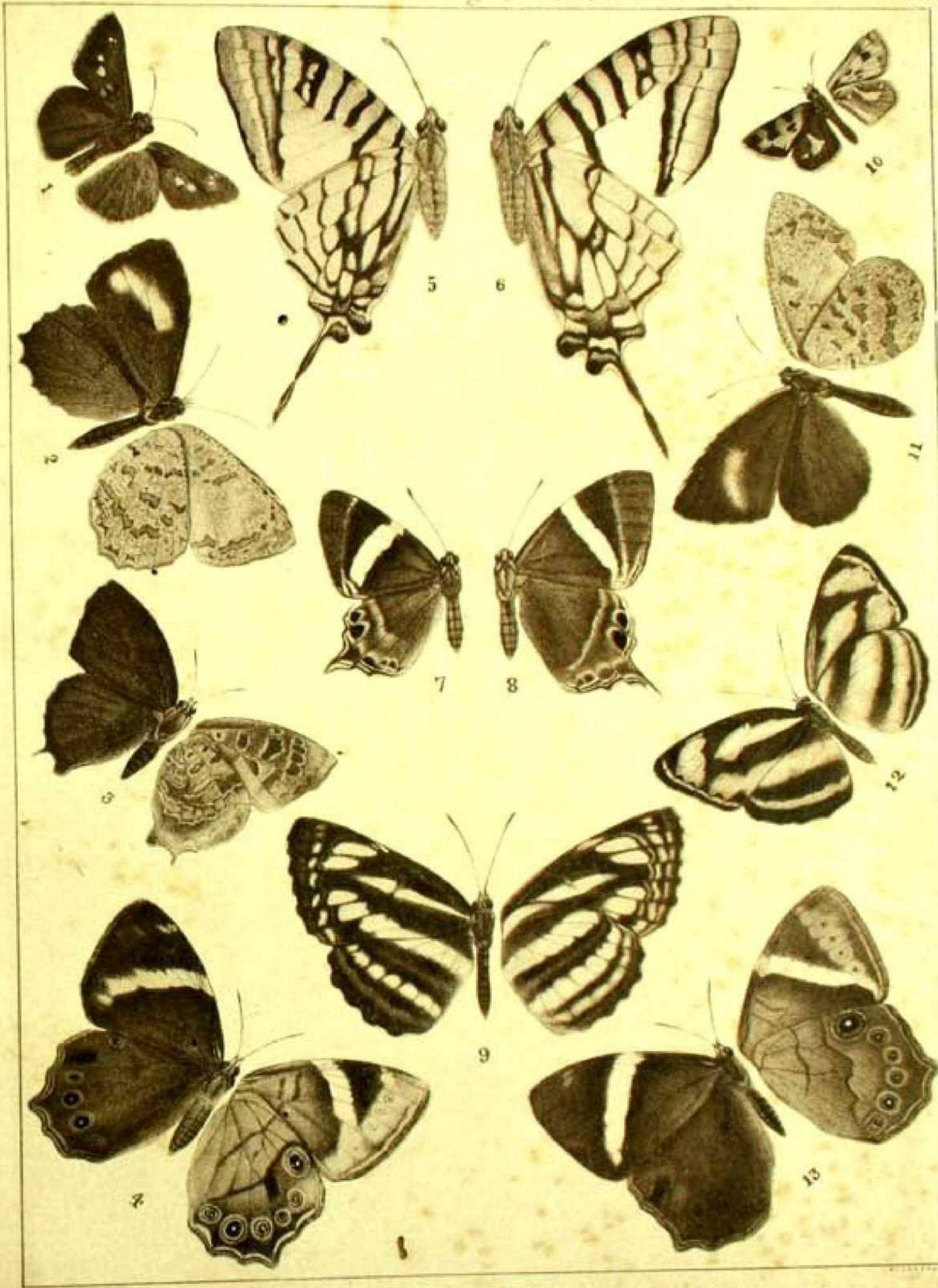
West, Newman & Co. imp.

PRIMULA JAFFREYANA, King.

L. DE NICÉVILLE. Journ. Asiat. Soc. Bengal, 1886, Vol. LV, Pt. II. Pl. XI.



NEW INDIAN BUTTERFLIES.

JOURNAL

OF THE

ASIATIC SOCIETY OF BENGAL.

Part II.—NATURAL SCIENCE.

No. IV.—1886.

XVI.—*The Landshells of Perak.*—*By* O. F. VON MÖLLENDORFF, PH. D. *Communicated by the* NATURAL HISTORY SECRETARY.

[Received September 18th ;—Read November 3rd, 1886.]

The following notes are based on a collection made by Deputy Surgeon-General R. Hungerford during a short visit to Perak, and on a number of shells received by the Indian Museum from Larut. I have thought it advisable to combine with the description of these a list of all species hitherto known from Perak. So far as I know, only the following papers have been published on the subject :—

H. CROSSE, Mollusques nouveaux de Perak. J. de Conch., xxvii, 1879, pp. 198—208 (5 sp.).

H. CROSSE, Faune malacologique de Perak. Ibid., pp. 336—340 (18 sp.).

H. H. GODWIN-AUSTEN and G. NEVILL, Shells from Perak (and the Nicobar Islands). Proc. Zool. Soc. Lond., 1879, pp. 734—740 (9 sp.).

J. DE MORGAN, Note sur quelques espèces nouvelles de mollusques terrestres recueillis dans la Péninsule Malaise. Le Naturaliste, vii, 1885, No. 9, pp. 68—70 (16 sp.).

STREPTAXIDÆ.

1. STREPTAXIS PLUSSENSIS, de Morgan.

de Morgan, Le Natur., vii, 1885, No. 9, p. 68.

"Heliciform, of whitish colour, spire regular, very flat, base ventrose, smooth, upper side transversely striate. Umbilicus very wide, inner sides of all the whorls being visible, aperture triangular, slightly oblique, very irregular, having a tooth on the penultimate whorl and a groove ("sillon") in the upper part; 6 whorls, linear suture." Diam. maj. 7, alt. 3 mill.

Hab.—Mt. Tchékèl in the valley of the river Pluss.

This description is not sufficient to enable one to form an idea of the value of the species, which has to be compared with the several species described from the Malay peninsula.

2. ENNEA PERAKENSIS, Godwin-Austen & G. Nev.

Godwin-Austen & Nevill, P. Z. S., 1879, p. 735, t. lix, f. 2.

Dr. Townsend found two apparently immature specimens of an *Ennea* at Buket Pondong, which the late Mr. G. Nevill considered to be full-grown and to be the type of a new subgenus of *Ennea*. Col. Godwin-Austen, however, deemed it best, considering only two specimens were found and that these were so similar in general form to immature specimens of *Ennea stenopylis*, Bens., from the Khasi Hills, not to found this new subgenus until further examples were obtained proving that the shell was a mature form. The results of Mr. Hungerford's investigations have justified Col. Godwin-Austen's caution. He found this *Ennea* in different stages of maturity, some entirely corresponding to the figure above quoted, but also some full-grown. The diagnosis has accordingly to be altered as follows:—

Testa aperte perforata, cylindraceo-claviformis, solidula, nitida, viridescenti-crystallina, anfr. 2 apicales fere glabrati, tertius confertim costulatus, reliqui 4½ costulis validis, planiusculis, subdistantibus, paullum arcuatis sculpti, ultimus penultimo angustior, circa umbilicum valde compressus, obtuse carinatus, antice substrangulatus, scrobiculatus. Apertura fere verticalis, rotundato-tetragona, peristoma latiuscule expansum, albolabiatum, margine externo ad insertionem subito attenuato, sinuato. Lamella parietalis valida usque ad marginem producta, callo dentiformi in palato opposito. Long. 4, diam. 2 mill.

The other teeth which immature specimens show on the columella and in the palate, disappear in the full-grown shell. The analogy with *E. stenopylis*, Bens., pointed out by Godwin-Austen, exists also in full-grown specimens. *E. perakensis* is, however, a little longer, more cylindrical, the costulation more distant, and the ribs higher and less arcuate.

Our species as well as the following one belongs to the group of Indian and Chinese species for which the late Mr. Nevill has founded the subgenus *Martensia*. This name has, however, been pre-occupied by Semper (Landsch-Philipp., I, 1870, p. 42) for a genus of the *Zonitidæ*, type *Nanina mossambicensis*, Pfr. Although *Martensia*, Semp., has been considered a synonym of *Trochonanina*, Mouss., by some authors, doubts have been expressed more recently whether the Polynesian species of *Trochonanina* really belong to the same section as the East African carinate forms of *Nanina*. If not, *Martensia*, Semp., has to be retained for the latter group, and the section *Martensia*, Nev., has to be renamed.

3. ENNEA HUNGERFORDIANA, n. sp.

T. aperte perforata, ovato-conica, sulcis validiusculis, subdistantibus verticalibus sculpta, viridescenti-crystallina; anfr. $6\frac{1}{2}$ *convexiusculi, ultimus angustior, basi valde compressus, substrangulatus, valde scrobiculatus, paullum ascendens. Apertura verticalis, parva, irregulariter ovalis, peristoma late expansum, margine externo ad insertionem subito attenuato, recedente, profunde sinuato. Lamella parietalis altissima, callum dentiformem marginis externi fere attingens et cum illo sinulum fere circularem formans.* Long. 3, diam. $1\frac{1}{2}$ mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

Smaller and more ovate than the last. The greatest peculiarity of the species is the sinulus of the aperture. In most species of *Ennea*, the parietal lamella is opposed to a tooth or dentiform callosity in the outer margin of the peristome, which latter gets suddenly thinner from that place to the insertion and is more or less sinuate. Thus the lamella and tooth enclose a more or less circular orifice connected with the rest of the aperture by a small canal. In our species, the lamella is so much prolonged that it all but touches the tooth of the outer margin, and it looks as if the lamella really were the continuation of the peristome. The latter is, from the tooth upwards, not only suddenly attenuate, but also receding, so that the orifice or sinulus is hardly visible in front, but appears, when the shell is turned sideways, very much like a commencing tube. The only species in which I have seen a similar formation is *Ennea vara*, Bens., otherwise widely different from *E. hungerfordiana*.

NANINIDÆ.

4. ARIOPHANTA, n. sp. (?), (prox. N. (A.) INTERRUPTA), G. Nevill, Handl. Moll. Ind. Mus., 1878, p. 20.

Nualla Kangsa, Perak; coll. Dr. Edmond Townsend.

No species of *Ariophanta* was found by Mr. Hungerford.

5. RHYSOTA, sp.

Mr. Hungerford obtained a single specimen of a fine large *Nanina*, diam. 55, alt. 32 mill. It is greenish-brown with a narrow dark brown band round the periphery and another broader one round the umbilicus, the periphery is obtusely angulate, the spiral rugose sculpture is coarser above, finer and more regular at the base; 6 moderately convex whorls form a little elevated spire. The nearest relation seems to be *Nanina pluto*, Pfr., from Cambodja, but it is probably a new species which I do not care to describe from a single example.

6. Hemiplecta cymatium, Bens.

Perak, without distinct locality (*Hungerford*). The single specimen agrees fairly well with the figure and description of *Nanina cymatium*, known from Penang and Malacca.

7. Euplecta bijuga, Stoliczka.

Stoliczka, J. A. S. B., xlii, pt. 2, 1873, p. 14, t. i, f. 4—7, t. ii, f. 16—18 (*Rotula*). *Helix bijuga*, Pfeiffer, Mon. Hel., vii, 1876, p. 103. *Nanina bijuga*, G. Nevill, Handl. Moll. Ind. Mus., 1878, p. 31. *Nanina* (*Rotula*) *bijuga*, Crosse, J. de Conch., xxvii, 1879, p. 336.

Buket Pondong (*Dr. Townsend, Hungerford*), originally described from Penang.

8. Macrochlamys, sp.

Mr. Hungerford found a few dead specimens at Buket Pondong which fairly agree with the form figured by Godwin-Austen (Land & Freshw. Moll. Ind., iv, 1883, p. 110, t. xxvi, f. 4) and mentioned by him as "*M. consepta*, Bens., small var.?" from Tenasserim.

9. Macrochlamys, sp. an nova?

A single specimen from Buket Pondong. Small, 3 mill. long and 2 high, horn brown, well-polished, probably new.

There is besides another much smaller species of *Macrochlamys* and a species of *Microcystis*, which I have likewise left undescribed on account of the very scanty material.

10. Microcystina townsendiana, Godwin-Austen & G. Nevill.

Godwin-Austen & Nevill, P. Z. S., 1879, p. 736, t. lix, f. 1.

Buket Pondong (*Dr. Townsend, Hungerford*).

11. Kaliella perakensis (G. Nevill), Godwin-Austen.

Godwin-Austen, Land & Freshw. Moll. Ind., i, 1882, p. 8, t. ii, f. 7.

Perak (*Dr. Townsend*), Buket Pondong (*Hungerford*).

12. Sitala carinifera, Stoliczka.

Stoliczka, J. A. S. B., xlii, pt. 2, 1873, p. 16, t. i, f. 8. Godwin-Austen, Land & Freshw. Moll. Ind., ii, 1882, p. 35.

Penang (*Stoliczka*). Mr. Hungerford found two badly preserved specimens at Buket Pondong which agree entirely with Stoliczka's figure and description.

HELICIDÆ.

13. HELIX (TRACHIA) MALAYANA, n. sp.

T. latiuscule umbilicata, depressa, tenuis, pilis brevissimis in lineas regulares valde approximatas dispositis hirsuta, rufobrunnea ; anfr. 5½ *perconvexi sutura valde impressa juncti, spiram fere planam apice vix prominulo efficientes, ultimus maximus, valde inflatus, antice breviter descendens, circa umbilicum subacute angulatus, apertura non valde obliqua, rotundato-lunaris, peristoma tenue, breviter expansum, vix reflexiusculum, sinuosum, roseum.* Diam. maj. 23, min. 18, alt. 14 mill.

HAB.—In regione Perak, leg. cl. R. Hungerford.

I have little doubt that this is the form mentioned by Crosse (J. de Conch., 1879, p. 336) as *H. (Planispira) breviseta*, Pfr., from Buket Pondong, but judging from Pfeiffer's diagnosis—all I can compare at present—I do not believe that the Perak form can be combined with Pfeiffer's Siamese species. The latter is pale yellow ("pallide fulvida"), round the umbilicus only "subangulatus," the peristome is white, the dimensions are 22 mill. diam., 10½ mill. alt., there are only 5 whorls. There appears to be a great deal of affinity, and the comparison of the types may probably result in making the Perak form a variety of *H. breviseta*, Pfr., but for the present I prefer to give it a separate name.

14. A second species of *Trachia*, of which only a few dead examples were found at Buket Pondong, is smaller, the whorls increase more regularly and the last one is not so prominently large ; the spine is a little more prominent, the angle round the umbilicus much more obtuse. This is perhaps *Trachia penangensis*, Stol.

15. HELIX PERAKENSIS, Crosse.

Crosse, J. de Conch., xxvii, 1879, p. 199, t. viii, f. 4 (*Geotrochus*).

Perak *(Dr. Townsend)*, not found by Mr. Hungerford. I have some doubts about its really being a *Geotrochus*, a group which has not yet been observed in the Indian region. The figure gives the idea rather of *Satsuma* (or *Fruticotrochus*, Kob.), which group is widely spread in China, and might very well range into the Malay peninsula hitherto so little explored.

Mr. de Morgan's paper contains the following *Helix* :—

16. HELIX SWETTENHAMI, de Morgan.

de Morgan, l. c., p. 68.

Upper portion of the Kinta valley. 16 mill. wide, 10 high; flat, strongly keeled, peristome acute, columellar margin reflected to the umbilicus. May be a *Trochomorpha* or a *Plectotropis*.

17. HELIX THIEROTI, de Morgan.

de Morgan, l. c., p. 68.

"Gounong-Tcheura," N. of Ipoli, Kinta valley.

Similar to the last, but discoid, reddish brown, diam. 15, alt. 4 mill. This is most probably a *Trochomorpha*.

18. HELIX HARDOUINI, de Morgan.

de Morgan, l. c., p. 68.

Kinta valley between Lahat and Ipoli.

Diam. 17 mill., alt. 8 mill., flat, strongly keeled, peristome expanded ("évasé.") Perhaps also a *Trochomorpha* or else a *Plectotropis*.

19. HELIX LAHATENSIS, de Morgan.

de Morgan, l. c., p. 68.

Between Lahat and Ipoli, Kinta valley.

Diam. 25 mill., alt. 14 mill., flat, slightly ("légèrement") umbilicated, strongly keeled, yellow ("blonde"), transparent, peristome acute, thin, columellar margin slightly reflected towards the umbilicus. Might also be a *Trochomorpha*.

BULIMIDÆ.

20. AMPHIDROMUS PERVERSUS, Linn.

Perak (*Dr. Townsend*).

STENOGYRIDÆ.

21. STENOGYRA (OPEAS) GRACILIS, Hutton.

Buket Pondong (*Hungerford*).

22. STENOGYRA (SUBULINA) TCHEHELENSIS, de Morgan.

T. elongate turrita, gracilis, tenuis, transverse densissime arcuatim striatula, corneo-flavida, opaca; anfr. 12 *planiusculi, spiram elongatam apice subacuto efficientes; apertura obliqua, angulate ovalis, peristoma acutum, margine dextro sinuoso; columella subincrassata, paullum arcuata, basi truncata, cum margine basali angulum rotundatum formans.*

Long	33½	diam.	6	mill.	(anfr.	12	)
„	24½	„	4¾	„	(„	10	)
„	23	„	5	„	(„	„	)
„	21	„	4½	„	(„	9½	)

1878. *Stenogyra (Opeas) terebralis ?*, Theobald (? n. sp.) G. Nevill, Handl. Moll. Ind. Mus., 1878, p. 166.

1879. *Stenogyra tchehelensis*, J. de Morgan, Le Naturaliste, vii, 1885, No. 9, p. 69.

HAB.—Mt. Tchéhèl prope flumen Pluss *(de Morgan)*, Buket Pondong *(Dr. E. Townsend, Hungerford)*.

I cannot but believe that the fine *Subulina* collected by Mr. Hungerford at Buket Pondong is the same which Mr. Nevill mentions from the same locality as a doubtful *H.* (*Opeas*) *terebralis*, Theob., or a n. sp. I have no figure of Theobald's species at my disposal—has it been figured at all ? the Conchologia Indica does not give it—but if the species of the Shán States is really an *Opeas*, it cannot be identical with the Perak form, which decidedly belongs to *Subulina*. De Morgan's description of his *H. tchehelensis* is somewhat vague and apparently was taken from immature examples, but, as the dimensions given by him of a specimen having 10 whorls—23 × 5 mill. agree perfectly with those of some younger specimens in Mr. Hungerford's collection, I think the two forms of different Perak localities may be safely combined.

23. RHODINA PERAKENSIS, J. de Morgan.

de Morgan, l. c. 1885, p. 68.

Limestone rocks of Gounong Tcheura near Ipoli, Kinta valley, under dead leaves.

Mr. de Morgan has founded a new genus for a curious *Stenogyra*-like shell, which he considers to be related to *Rhodea*. It may be worth while to translate his description here :—“ Shell cylindraceous, striate, dextrorse, numerous whorls, apex obtuse, last whorl much larger than the penultimate, aperture triangular, columellar margin reflected and very prominent [“ saillant ”], peristome continuous. Differs from the genus *Rhodea* by the aperture “ disposée en cornet ” and by the want of a keel.” I must confess that I fail to perceive any relation to *Rhodea* from these remarks. The descriptive notes on the species are meagre also ; it is cylindrical, fragile, horny yellow, has 10 regularly increasing whorls very regularly and distinctly striate, the suture is linear and well-marked, the aperture triangular, oblique, peristome thin, not reflected (“ non déjeté ”). Long. 25, diam. of last whorl 4½, long. of aperture 5, lat. 3 mill.

It is to be regretted that this apparently very interesting form has not been figured. Might it not be related to *Perrieria*, Tapp.-Can., of Borneo?

CLAUSILIIDÆ.

24. Clausilia (Pseudonenia) filicostata, Stoliczka,

Stoliczka, J. A. S. B., xlii, pt. 2, 1873, p. 28, t. iii, f. 7, 8.

Var. *tenuicosta*, G. Nevill, Handl. Moll. Ind. Mus., 1878, p. 183. H. Crosse, J. de Conch., xxvii, 1879, p. 337.

Buket Pondong *(Dr. Townsend, Hungerford)*.

The few badly preserved specimens which Mr. Hungerford found at Buket Pondong seem to justify Mr. Nevill's classification of the Perak form as a variety of the Penang *Clausilia filicostata.* The variety is longer, up to 24 mill., at the same time slenderer, the striation is much finer so that it could hardly be called costulate, there are fine spiral lines besides, 12 whorls instead of 10—11. It might even be separated as a species, especially if there are differences in the closing apparatus, the description of which is insufficient in Stoliczka's diagnosis. As I am unable to compare specimens of the typical *Clausilia filicostata,* I must leave this question undecided.

PUPIDÆ.

25. Hypselostoma bensonianum, W. Blanford.

W. Blanford, Contr. Ind. Mel., iv, 1863, p. 8. Pfeiffer, Mon. Hel., v, 1868, p. 437. Conch. Ind., t. viii, f. 2.

Of the three species of *Hypselostoma* hitherto described, *H. bensonianum* is the only one with which the form collected by Mr. Hungerford at Buket Pondong can be combined. Diagnosis and figure agree fairly well, but the latter is not very exact, at least not detailed enough for a small form, and the description might also be more complete. It is besides not very likely that the same species ranges from Ava into Perak, while there occurs another species at Moulmein. A comparison of specimens of *H. bensonianum* with the Perak form may therefore result in separating the latter as a distinct species. Unfortunately I do not possess the Ava species.

CYCLOPHORIDÆ.

CYCLOTINÆ.

26. Cyclotus hungerfordianus, n. sp.

Testa aperte umbilicata, depressa, plicis distantibus transversis sculpta, in interstitiis plicarum striis transversis subtilibus et lineis spiralibus *rugosulis minutissime granulata, viridescenti-cornea, spira breviter conoidea apice mamillari, nitido. Anfr. 4 teretes, ad suturam profundam planati, ultimus ad aperturam valde descendens, breviter solutus. Apertura diagonalis, circularis, peristoma continuum, rectum. Operculum testaceum, crassum; peripheria sulco late exaratum, extus valde concavum marginibus anfractuum breviter elevatis, anfractus 8 oblique plicato-striati.* Diam. maj. 7½, alt. 5 mill.

Hab.—Ad Buket Pondong, leg. cl. R. Hungerford.

This species is most probably the same which is mentioned in G. Nevill's Handl. Moll. Ind. Mus., 1878, p. 256, as *Cyclotus*, n. sp., found at the same locality by Dr. E. Townsend. It belongs to the group of *C. pusillus*, Sow., *hunanensis*, Gredl., etc., which Prof. von Martens has named *Cycloti suturales* (Landschn. Ostas., 1867, p. 124).

Mr. J. de Morgan describes (l. c., 1885, p. 69) an *Aulopoma lowi* from the Kinta valley, which I suspect to be a *Cyclotus* very similar to, if not identical with, the above species. The dimensions are about the same, 8 and 5 mill., and the short description of the shell agrees very well, especially the remark that the live shell is covered with a layer of mud. This covering seems to be characteristic of the group, as I have observed it, not only in *C. hungerfordianus*, but also in all Chinese and Philippine species. The description of the operculum does not in any way point to *Aulopoma*, hitherto not known out of Ceylon. He calls it circular, horny, composed of lamellæ placed one upon another, slightly convex on the inner side. This might fairly well apply to the operculum of a *Cyclotus*, certainly not to that of an *Aulopoma*. If my supposition as to the identity of the two species be correct, the question arises whether the rules of priority require that the species should be called *Cyclotus lowi*, de Morg. I think that the publication of a *Cyclotus* as an *Aulopoma* in such an insufficient way that its identity can only be guessed, does not entitle it to priority, but, as this can only be decided after typical specimens of both species have been compared, I have thought it better to publish the species collected by Mr. Hungerford under a new name.

27. OPISTHOPORUS SOLUTUS, Stoliczka.

Stoliczka, J. A. S. B., xli, pt. 2, 1872, p. 266, t. x, f. 8—10. Pfeiffer, Mon. Pneum., suppl. iii, 1876, p. 44. G. Nevill, Handl. Moll. Ind. Mus., 1878, p. 263. H. Crosse, J. de Conch., xxvii, 1879, p. 337.

Buket Pondong *(Dr. Townsend, Hungerford)*; Penang *(Stoliczka)*.

28. OPISTHOPORUS PENANGENSIS, Stoliczka.

Stoliczka, l. c., 1872, p. 265, t. x, f. 7. Pfeiffer, Mon. Pneum., suppl. iii, 1876, p. 43. G. Nevill, Handl., 1878, p. 263. H. Crosse, l. c., 1879, p. 338.

Buket Pondong (*Dr. Townsend, Hungerford*); Penang (*Stoliczka*).

According to Crosse, Prof. von Martens considers this form to be a simple variety of *O. corniculum*, Mouss., of Java, whilst Stoliczka compared it to *O. sumatranus*, Mart., of Sumatra. The descriptions of these species do not, however, mention the two lines of short cilia above and below the periphery (as in *O. biciliatus*, Mouss.), which seems to me to be a good specific character.

CYCLOPHORINÆ.

29. SPIRACULUM ? REGELSPERGERI, de Morgan.

de Morgan, Le Nat., vii, 1885, No. 9, p. 69 (*Cyclophorus*).

"Very depressed, very widely umbilicated, 5 whorls, very finely striate; suture linear, under which there is a deep groove ("sillon") covered by the margin which forming a canal along the suture is enlarged towards the aperture and ends in a lamina ("lame") which covers the canal entirely and forms a tube of 4—5 mill. in length. Aperture oblique, nearly circular, slightly reflected, near the suture winged ("échancrée"). Colour horny above, brown at the base, a black band round the periphery, regularly arranged brown spots on the upper side which give the shell the aspect of a rolled-up snake. Operculum circular, horny, inner side presenting a spherical depression with a prominent nucleus in the centre, outer side helicoid ("hélicoïdale") furnished with very fine membranaceous lamellæ destined to render the fitting of the operculum more hermetic." Alt. 8, diam. maj. 25, diam. apert. 8 mill.

HAB.—Environs of Lahat and Pappan, Kinta valley (*J. de Morgan*), Larut (*Ind. Mus.*).

I have tried to give a literal translation of de Morgan's description, which certainly lacks the technical precision of a diagnosis, but at least permits me to recognise his species in an immature example from Larut. It is decidedly not a *Cyclophorus*: I considered the Larut specimen to be a *Pterocyclus* which might, on account of the curious canaliculated suture, be related to *Pterocyclus albersi*, Pfr. De Morgan's mention of a tube and description of the operculum point to *Spiraculum*; I should also have thought of *Rhiostoma*, but there is no mention of the last whorl being solute. Whether the species is really new or has to be combined with a Burmese or Siamese form I cannot now decide.

30. SPIRACULUM KINTANUM, de Morgan.

de Morgan, l. c., 1885, p. 69 (*Cyclophorus*).

Kinta valley.

This is most probably a *Spiraculum*: the operculum is analogous to that of the last species; there is at a short distance from the aperture a small sutural tube bent backwards. The shell is greenish-brown, much depressed, the last whorl slightly solute. Diam. maj. 19, alt. 5 mill.

31. CYCLOPHORUS MALAYANUS, Bens.

Larut (*Ind. Mus.*), Buket Pondong (*Dr. Townsend* teste G. Nevill, Handl., 1878, p. 267), otherwise known from Penang, Siam, Burma.

32. CYCLOPHORUS SEMISULCATUS, Sowerby.

Buket Pondong (*Dr. Townsend* teste G. Nevill, Handl., 1878, p. 269, err. typ. "*C. semistriatus*").

33. CYCLOPHORUS EXPANSUS, Pfr., ? var.

G. Nevill, Handl., 1878, p. 269, "appears to be new; it is near *C. cyœus*."

Buket Pondong (*Dr. Townsend*).

34. CYCLOPHORUS LOWI, de Morgan.

de Morgan, l. c., 1885, p. 69.

Kinta valley, common; Patani. According to the author's remarks this is a fine shell of 55 mill. diameter; the description is, however, so incomplete that no attempt to compare it to a known species can be made. Not even the colour of the shell is indicated. It may be *C. aurantiacus*, Schum., widely distributed in the Malay peninsula.

35. LEPTOPOMA ASPIRANS, Benson.

Buket Pondong (*Dr. Townsend, Hungerford*), Burma, Pegu, Tenasserim.

36. LAGOCHILUS TOWNSENDI, Crosse.

Crosse, J. de Conch., xxvii, 1879, pp. 200, 339, t. viii, f. 3, = *Lagocheilus*, n. sp., G. Nevill, Handl., 1878, p. 282, = *Cyclophorus baylei*, de Morgan, l. c., 1885, p. 69.

Buket Pondong (*Dr. Townsend, R. Hungerford*), abundant in the basin of the Perak river, especially in the Pluss valley (*de Morgan*).

Mr. Hungerford brought some specimens from the original habitat which entirely agree with the very exact description of Mr. Crosse. I am rather inclined to consider the Perak shell merely a variety of *L. trochoides*, Stol., from Penang to which it is closely related; being, however, unable to compare specimens of the latter, I follow Messrs. Crosse and Nevill for the present.

So far as can be judged, or rather guessed, from Mr. de Morgan's short remarks on his "*Cyclophorus baylei*," it is a *Lagochilus* and most probably identical with *L. townsendi*, Crosse.

ALYCÆINÆ.

37. ALYCÆUS GIBBOSULUS, Stoliczka.

Stoliczka, J. A. S. B., xli, pt. 2, 1872, p. 268, t. x, f. 14. Pfeiffer, Mon. Pneum., suppl. iii, 1876, p. 58. G. Nevill, Handl., 1878, p. 295. Crosse, J. de Conch., xxvii, 1879, p. 339, t. xii, f. 8.

Originally described from Penang, but found at Buket Pondong by Messrs. Townsend and Hungerford. The Perak form presents some slight differences, *viz.*, pale whitish colour, broader base, and more inflated last whorl, but these do not justify the separation even as a variety.

38. ALYCÆUS PERAKENSIS, Crosse.

Crosse, J. de Conch., xxvii, 1879, pp. 206, 339, t. xii, *f.* 7.

Discovered by Dr. Townsend at Buket Pondong, where Mr. Hungerford also collected it in some numbers. Crosse justly compares it with *A. jagori*, Mart., from Java, from which it is, however, well distinguished by its greater size and bright yellow colour, the smaller number of its whorls, its spiral sculpture.

39. ALYCÆUS DIPLOCHILUS, n. sp.

Testa late umbilicata, depressa, subdiscoidea, solidula, subtiliter subdistanter costulato-striata, nitidula, rubescenti-cornea ; spira breviter conoidea apice obtuso. Anfr. 4 *convexi, ultimus ad peripheriam obtuse angulatus, basi valde inflatus, gibbus, ab apertura sat remote* (*ca.* 2 *mill.*), *profunde constrictus, dein tumidulus, sub tubulo suturali brevi ca.* ½ *mill. longo dense costulatus, ad aperturam glabratus, valde deflexus. Apertura maxime obliqua, subcircularis, peristoma duplex, internum continuum, expansum, externum ab illo sulco distincto separatum, latissime expansum.* Diam. maj. 4, min. 3, alt. 2 mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

40. ALYCÆUS OLIGOPLEURIS, n. sp.

Testa sat aperte umbilicata, depressa, subdiscoidea, distanter et minute costulata, albescens, nitidula, spira brevissime conoidea, apice obtuso. Anfr. 3½—4 *convexi, ultimus basi inflatus, gibbus, ab apertura sat remote constrictus, dein tumidulus, subglabratus, ad aperturam subito deflexus, sub tubulo suturali brevissimo densissime costulatus. Apertura maxime obliqua, subcircularis, peristoma duplex, internum porrectum, duplicatum, externum sulco distincto ab illo separatum, expansum, reflexiusculum.* Diam. maj. 2¼, min. 1¾, alt. 1⅓ mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

Related to the last, but much smaller, more distantly ribbed, ultimate whorl without angulation at the periphery, the inner peristome much more prominent and the outer less widely expanded.

41. ALYCÆUS MICRODISCUS, n. sp.

Testa aperte umbilicata, discoidea, densissime costulata, cornea, spira brevissime prominula. Anfr. 3½—4 *convexi, ultimus valde remote ab apertura leviter constrictus, dein distortus et ascendens, ad aperturam breviter deflexus, subtus paullum inflatus, gibbus, tubulus suturalis brevissimus. Apertura parum obliqua, subcircularis, peristoma duplex, externum expansum, reflexiusculum, internum porrectum, expansiusculum.* Diam. maj. 2¾, min. 1⅔, alt. 1 mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

The peculiar distorsion of the last whorl, which first ascends after the constriction and is then again deflected towards the aperture, separates this minute species from all forms known to me.

42. ALYCÆUS PARVULUS, n. sp.

Testa sat aperte umbilicata, discoidea, confertim et minute costulata, cornea; spira brevissime prominula; anfr. 3½—4 *convexi, ultimus paullum ab apertura remote leviter constrictus, dein tumidulus, basi parum inflatus, subgibbus, tubulus suturalis brevissimus; apertura diagonalis, circularis, peristoma duplex, externum late expansum, internum late porrectum, expansiusculum.* Diam. maj. 1⅔, alt. ¾ mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

Another minute form, still smaller than the last, to which it appears somewhat related. It differs, however, in the constriction being comparatively nearer to the aperture, the almost regular last whorl, the broad outer and very prominent inner peristome.

43. ALYCÆUS MICROCONUS, n. sp.

Testa umbilicata, globoso-conica, costulis confertis transversis et lineis spiralibus quasi reticulata, cornea; anfr. 4 *convexi, ultimus pone aperturam leviter constrictus, sub tubulo suturali modico densius costulatus, dein subglabratus, non descendens. Apertura parum obliqua, fere circularis, peristoma breviter expansum, tenue, subduplicatum.* Diam. maj. 1¾, alt. 1½ mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

By the conical shape, the regular last whorl, the reticulate sculpture this small species is very well distinguished from all Indian *Alycæi.*

Mr. J. de Morgan describes, in the paper already mentioned, two species of *Alycæus* from Perak, one of which appears to be a remarkable novelty.

44. ALYCÆUS JOUSSEAUMEI, de Morgan.

de Morgan, Le Natural., vii, 1885, No. 9, p. 70.

"White, perforate, depressed, whorls convex, suture deep, last whorl very ventrose and strongly contracted a little above the circular aperture, sculptured by fine transverse striæ; above the contraction a sutural tube, the length of which varies with the age of the shell. Peristome double, reflected, presenting the form of a horseshoe, the concave side of which is turned to the umbilicus. Operculum horny, multispiral, circular, concave, inner side with a prominent central nucleus." Diam. maj. 11—15 mill., alt. 6, apert. diam. 4 mill.

So far as can be judged from this not very exhaustive description, the species would appear to be related to *A. umbonalis*, Bens., and *physis*, Bens. It is the largest form hitherto described.

HAB.—Limestone hills of the Kinta valley, summit of Mt. Lano.

The other species, *A. chaperi*, de Morg. (l. c., p. 70), is probably *A. gibbosulus*, Stol., or at least closely related to that species; the meagre description does not, however, permit an identification with any degree of certainty.

DIPLOMMATININÆ.

45. DIPLOMMATINA CANALICULATA, n. sp.

T. dextrorsa, conico-turrita, costulis acutis distantibus sculpta, corneo-flavescens, spira elongata, regulariter conica, apice acuto; *anfr.* 10 *perconvexi, ultimus initio constrictus, penultimo multo angustior, ad aperturam ascendens. Apertura verticalis, angulato-subcircularis, peristoma duplex, externum late expansum, reflexiusculum, internum sulco ab illo separatum, expansiusculum, superne appressum. Columella basi truncata, cum margine basali angulum canaliformem formans. Lamella columellaris, validiuscula fere ad marginem producta.* Alt. 5, diam. 2 mill.

HAB.—Ad Buket Pondong, leg. cl. R. Hungerford.

This novelty is well characterized by the long regular conical spire, the distant and very sharp ribs, the curious angle at the base of the columella, which forms almost a canal and is distinctly continued into both peristomes. The latter are prolonged round this angle into a spur-like excrescence. Similar formations are observed in several Indian and Chinese species, but in none are they so well developed as in this.

46. DIPLOMMATINA NEVILLI, Crosse.

Crosse, J. de Conch., xxvii, 1879, pp. 203, 339, t. viii, f. 2 (*Palaina*).

Discovered by Dr. Townsend and also found by Mr. Hungerford at Buket Pondong. I do not know why the author classes it as a *Palaina*; it appears to me to be a typical *Diplommatina* with well-developed columellar lamella. The truncation of the columella and the canal-like angle at its base are similar to those of the last-named species, though not quite so distinct. It is only 3 mill. long.

47. DIPLOMMATINA CROSSEANA, Godwin-Aust. & G. Nev.

Godwin-Austen & Nevill, P. Z. S., 1879, p. 738, t. lx, f. 3, 3*a*.

Buket Pondong (*Dr. Townsend, R. Hungerford*).

Very small, only $1\frac{1}{3}$ mill. in length, dextrorse, antepenultimate whorl the largest. I believe it to belong to the section *Diancta*, Mart.

48. DIPLOMMATINA MIRABILIS, Godwin-Aust. & G. Nev.

Godwin-Austen & Nevill, l. c., p. 739, t. lx, f. 4, 4*a*, 4*b*.

Buket Pondong (*Dr. Townsend*), not found by Mr. Hungerford. Dextrorse, $1\frac{3}{4}$ mill. in length. From the figure and description I see no reason why it should be classed as *Palaina*, as the authors have it.

49. DIPLOMMATINA SUPERBA, Godwin-Aust. & G. Nev.

Godwin-Austen & Nevill, l. c., p. 739, t. lx, f. 5, 5*a* (*Palaina*).

Buket Pondong (*Townsend* and *Hungerford*).

This truly "superb" little shell presents, it is true, some similarities with species of *Palaina*, but chiefly in the sculpture, on which subgeneric distinctions should not be based. On account of the constricted penultimate whorl I should class it as a *Diancta*.

50. OPISTHOSTOMA PAULUCCIÆ, Crosse & Nevill.

Crosse & Nevill, J. de Conch., xxvii, 1879, pp. 197, 205, 339, t. viii, f. 1. Godwin-Austen & G. Nevill, Proc. Zool. Soc., 1879, p. 738, t. lx, f. 2, 2*a*, 2*b*.

51. OPISTHOSTOMA PERAKENSE, Godwin-Aust. & G. Nev.

Godwin-Austen & Nevill, l. c., p. 738, t. lx, f. 1, 1*a*, 1*b*.

Of these two species, both discovered by Dr. Townsend at Buket Pondong, Mr. Hungerford has, so far as I can see, only found the latter at the same locality.

PUPININÆ.

52. Pupina artata, Bens.

Buket Pondong (*Dr. Townsend, R. Hungerford*). Known from Ava, Burma.

53. Pupina arula, Bens.

Buket Pondong (*Townsend* and *Hungerford*), otherwise known from Burma.

54. Megalomastoma (Coptochilus) sectilabrum, Gould.

Perak (*Dr. Townsend*), Larut (*Ind. Mus.*). Described from Tavoy, Tenasserim, and found also on Penang.

55. Hybocystis elephas, de Morgan.

de Morgan, Le Natural., vii, 1885, No. 9, p. 70.

Testa anguste umbilicata, pupinæ-formis, solidissima, sublævigata, in anfractu ultimo distinctius rugoso-striata, rufo-carnea vel aurantiaca, spira irregularis ovata, apice conoideo-obtuso; sutura impressa, marginata albescens; anfr. 6 *convexiusculi, penultimus multo longior, supra aperturam planatus, dorso inflatus, ultimus angustior valde descendens, ante aperturam paullulum ascendens. Apertura verticalis, angulato-circularis, intus aurantiaca, peristoma multiplicatum crassissimum, aurantiacum, subtus protractum, margine externo ad angulum insertionis sursum producto. Operculum normale, intus castaneo-callosum, anfr.* 2½—3, *extus convexiusculum, albidum, anfr.* 7, *marginibus lamellatim elevatis. Axis* 47, *diam. anfr. penult.* 23, *aperturæ diam. intus* 15½, *c. perist.* 19½. *Peristoma usque ad* 8 *mill. crassum.*

Hab.—Per totam vallem fluminis Perak (*J. de Morgan*), Larut (*Ind. Mus.*).

The small collection from Larut which I received for inspection in 1885, contained this magnificent species, and I had determined to name and to describe it when I saw the notice of de Morgan's paper containing two species of *Hybocystis*. Presuming that one of these might be the Larut form, I delayed the publication until I had received the paper itself. Although the author's description is again insufficient, still I am convinced that his *H. elephas* from Perak is the same as the one from Larut. He gives even greater dimensions: long. 50—57, diam. 24—27, diam. apert. 17—20 mill.

If I am tolerably certain of this identification, I am not quite sure that the shell is really a novelty. There are three species of *Hybocystis* known, *H. gravida*, Bens., from Burma (Moulmein), *mouhoti*, Pfr., from Cambodja, and *myersi*, Haines, from Siam. Of none of these I have been able to compare specimens; from the published descriptions I glean the following differences between the four forms.

Name.	*gravida.*	*mouhoti.*	*myersi.*	*elephas.*
Axis.	35	35	39	50—57 mill.
Umbilication.	Perforate.	Subumbilicate.	Narrow.	Narrow.
Colour.	Whitish brown (fusco-albida).	Deep violet brown (saturate fusco-violacea).	Incarnate brown (carneo-fusca).	Reddish incarnate or orange.
Sculpture.	Rather smooth (læviuscula, vix striatula).	Slightly striate (striatula).	Sublævigate.	Sublævigate.
Last whorl.	* * * * * * Slightly and suddenly ascendent.	Foveolato-malleatus. Deeply descendent, ascendent at the aperture.	With irregular spiral sulci. Obliquely descendent.	With distinct rather irregular transverse stripes. Strongly descendent, close to the aperture very little ascendent.
Suture.	Impressed, marginate.	Not mentioned.	Slightly impressed.	Impressed, very distinctly marginate.
Aperture.	Circular.	Angulate oval.	Angulate oval.	Almost circular.
Peristome.	Whitish, incrassate, with an inner groove (intus late sulcatum).	Orange red, duplicate, outer margin at the insertion producted upwards.	Incrassate, the upper insertion angulate.	Orange, multiplicate, abnormally thick, outer margin at the insertion producted upwards.

Imperfect as this comparison from mere diagnosis must necessarily be, it seems to entitle the Perak shell to specific distinction.

56. Mr. de Morgan mentions (l. c., p. 70) a second species, *H. jousseaumei*, de Morg., from the Pluss valley, which is said to differ from *H. elephas* by the much smaller size, the white colour, the greater size of the last whorl at its beginning, the penultimate whorl having a rather prominent gibbosity at the right side, the flattening of the last whorl being more distinct, the margination of the suture deeper impressed, the narrower umbilicus, and the less reflected peristome. The

operculum has on the inner side a small dish-like prominence with a central nucleus, the outer side is more convex than in the last species. Axis 45, diam. 21, apert. diam. 15 mill. As the author does not mention how many specimens he found of this species which accompanied *H. elephas*, it may be but an individual deviation.

HYDROCENIDÆ.

57. GEORISSA MONTEROSATIANA, Godwin-Austen & G. Nevill.

Godwin-Austen & Nevill, Proc. Zool. Soc., 1879, p. 739, t. lix, f. 6.

Buket Pondong *(Dr. Townsend, R. Hungerford)*.

58. GEORISSA SEMISCULPTA, Godwin-Austen & G. Nevill.

Godwin-Austen & Nevill, l. c., p. 740, t. lix, f. 3, 3*a*.

Based on a broken specimen from Buket Pondong, not found by Mr. Hungerford.

I have not seen any freshwater shells from Perak; the second volume of Nevill's Handlist (1884) mentions only the following species from that region :—

p. 6. AMPULLARIA TURBINIS, Lea, var. SUBAMPULLACEA, G. Nev.
Perak *(Dr. Townsend)*.

p. 22. PALUDINA BENGALENSIS, Lam., subspec. POLYGRAMMA, v. Mart.
Qualla Kangsa *(Dr. Townsend)*.

p. 256. MELANIA EPISCOPALIS, Lea.
Qualla Kangsa *(Dr. Townsend)*.

p. 280. MELANIA JUGICOSTIS, Hanley.
Qualla Kangsa *(Dr. Townsend)*.

Manila, August, 1886.

XVII.—*On Solar Thermometer Observations at Allahabad.*—*By* S. A. HILL, B. Sc., *Meteorological Reporter to the Government of N.-W. Provinces.*

[Received October 26th ;—Read November 3rd, 1886.]

In April, 1883, I sent to the Society a paper on the measurement of solar radiation by means of the black-bulb thermometer *in vacuo*,* in which paper a very decided variation of solar heat emission during the sun-spot period was suggested. Last year also, I published a paper in this Journal,[*] in which a very similar conclusion was arrived at, by a totally distinct method, from the observations made on certain days at Lucknow. In the first paper, the monthly mean excess of the solar thermometer on clear days above the air temperature at noon was compared with the barometric pressure and the tension of vapour, as well as with a number representing a proportionate estimate of the amount of dust and haze in the month, and then, by combining the observations of the several months by means of Pouillet's formula (which makes allowance for the varying thickness of the atmosphere traversed by rays from the sun at different altitudes), transmission co-efficients for the various constituents of the atmosphere were computed. These co-efficients then served to correct the original observations to what would have been their probable value if there had been no atmospheric absorption, and it was in the annual means of such corrected observations that the variation in the sun-spot period appeared most distinctly.

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* *See* Journal Vol. LII, Part II.

In discussing the Lucknow observations, those taken with a non-registering thermometer at different hours of the same day were compared, and the "solar constant" was computed by Pouillet's formula. The resulting mean values, though founded on at most only four days' observations in each month, gave a very similar variation to that deduced from the Allahabad results, the maximum falling in 1878, which was the minimum year of the last sun-spot cycle.

The solar thermometer brought into use at Allahabad in 1876, a large one by Negretti and Zambra, continued to be used under nearly identical conditions until this year, when it was removed to the new observatory. It had been my intention to keep the exposure of the instrument as nearly constant as possible for ten or eleven years, when if any appearance of a cyclical variation were found in the observations, it might with much probability be assigned to real changes occurring in the sun. During my absence from India in 1883-84, however, the position of the instrument was changed, and the readings of it were permanently increased (apparently by reflection from a small mango tree) to the extent of about 2 degrees as empirically determined. In Table I., which gives a summary of the observations for ten years, the vitiated observations thus empirically corrected are printed in sloping figures.

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[*] Vol. LIV, Part II.

TABLE I.—*Excess Temperature of the Sun Thermometer on Clear Days above the Air Temperature at Noon.*

Year.	Jan.	Feb.	Mar.	April.	May.	June.	Oct.	Nov.	Dec.	Mean.
1876	66·1°	65·7°	63·9°	60·6°	56·5°	57·3°	60·3°	64·0°	64·0°	62·0°
1877	63·0	66·7	63·6	62·4	60·0	57·4	59·8	63·0	63·4	62·1
1878	65·9	64·3	65·2	64·5	62·3	57·8	59 6	64·7	64·6	63·2
1879	64·2	63·9	63·7	62·6	61·8	61·0	61·1	64·9	63·5	63·1
1880	63·0	63·8	60·3	59·9	62·0	61·5	58·3	62·5	60·6	61·3
1881	62·3	60·9	61·9	60·4	60·3	63·0	54·8	61·8	59·9	60·6
1882	60·5	61·5	60·1	61·1	60·6	59·1	54·6	62·2	58·2	59·8
1883	60·9	61·5	61·0	58·4	57·6	57·1	59·2	59·8	58·2	59·3
1884	58·3	60·5	59·3	61·1	58·9	55·9	*64·1*	*65·3*	*63·5*	*60·8*
1885	*63·2*	*66·2*	*63·0*	*62·2*	*61·0*	*58·1*	*61·6*	*64·3*	*63·6*	*62·6*
Mean	62·7	63·5	62·2	61·3	60·1	58·8	59·4	63·2	62·0	61·5

In this table, as in those already published, *clear* days are understood to be those on which the cloud proportion at 10 A. M. and 4 P. M. does not exceed one-fifth of the expanse. Such days are so uncommon in July, August, and September that these three months could not be included. The column of annual means indicates clearly a cyclical variation in the ten years, the maximum occurring in 1878-79 and the minimum falling about the end of 1883; hence, if such a variation appears in the computed values of the so-called solar "constant" given below, it cannot be set aside as a merely arithmetical result, since it is founded upon a similar variation in the data obtained by direct observation. The monthly means at the foot show a maximum in February and another in November, with a faintly marked minimum in the cold weather and another more distinctly marked in June. They should, however, be multiplied by the square of the earth's mean radius vector for each month to correct for the varying distance of the sun, before they can be properly compared, a point which was overlooked in my paper of 1883. When thus corrected they stand as follows :—

Jan.	Feb.	March.	April.	May.	June.	Oct.	Nov.	Dec.
60·7°	62·0°	61·7°	61·8°	61·5°	60·7°	58·9°	61·8°	60·0°

If the absorptive power of the atmosphere were constant, we should expect to find the maximum result in June, when the sun rises highest in the heavens, and the minimum in December, when the incidence is most oblique and the thickness of the atmosphere to be traversed by the rays is greatest. The actual variation which gives maxima in February or April and in November and minima in December and October must be due to the modifying influence of a variability of absorption.

For this only two causes in the least degree likely to produce the observed effect suggest themselves, changes in the quantity of water vapour in the air and changes in the thickness of the dust haze of the dry months.

Regarding the proportionate quantity of the latter in the several months, I think the scale laid down in my paper on the Lucknow observations probably represents the truth more exactly than that assumed in my former paper on the Allahabad results. This scale is :—

Jan.	Feb.	March.	April.	May.	June.	Oct.	Nov.	Dec.
3	5	7	9	10	6	0	1	2

The pressure of vapour and the total pressure of the air (which does not differ by more than one per cent. from the true pressure of the dry air alone) are given in the next two tables. The figures for June are for the first half of the month only, the clear days as a rule being confined to this half.

TABLE II.—*Mean Pressures of Water Vapour.*

Year.	Jan.	Feb.	Mar.	Apl.	May.	June.	Oct.	Nov.	Dec.	Mean.
1876	·312″	·295″	·356″	·330″	·524″	·700″	·678″	·447″	·343″	·443″
1877	·428	·349	·450	·534	·592	·775	·642	·474	·424	·519
1878	·364	·431	·392	·486	·630	·515	·648	·454	·318	·471
1879	·325	·354	·356	·325	·461	·568	·704	·365	·306	·422
1880	·335	·349	·417	·400	·650	·789	·605	·409	·340	·477
1881	·284	·357	·431	·433	·642	·859	·612	·352	·260	·475
1882	·335	·289	·300	·348	·469	·783	·635	·428	·348	·437
1883	·381	·298	·343	·393	·496	·693	·568	·354	·287	·424
1884	·335	·312	·315	·293	·433	·608	·663	·423	·373	·417
1885	·396	·291	·352	·374	·474	·563	·616	·401	·386	·428
Mean	·350	·332	·371	·392	·540	·685	·637	·411	·343	·451

TABLE III.—*Mean Barometric Pressure.* 29 *inches* +

Year.	Jan.	Feb.	Mar.	Apl.	May.	June.	Oct.	Nov.	Dec.	Mean.
1876	·681	·626	·541	·389	·300	·199	·605	·670	·787	·533
1877	·795	·736	·585	·506	·369	·303	·601	·678	·733	·590
1878	·771	·704	·599	·478	·380	·205	·482	·615	·693	·570
1879	·723	·646	·554	·402	·274	·219	·546	·686	·717	·530
1880	·679	·652	·509	·390	·305	·134	·562	·727	·768	·525
1881	·779	·690	·598	·417	·326	·194	·519	·653	·743	·547
1882	·751	·652	·557	·416	·337	·129	·492	·689	·711	·526
1883	·731	·683	·553	·400	·268	·185	·599	·655	·797	·541
1884	·770	·669	·537	·435	·297	·241	·608	·706	·794	·562
1885	·781	·666	·584	·452	·416	·264	·558	·714	·715	·553
Mean	·736	·672	·562	·430	·327	·207	·557	·679	·749	·547

From the monthly means of the excess temperatures and of these elements, as well as the proportionate figures for dust haze, we may compute the transmission co-efficients of the several constituents of the atmosphere by a modification of Pouillet's formula. For, putting R to stand for the observed radiation (as given in Table I.) and S for the solar "constant," we have $R = S. \alpha^{b\epsilon} \beta^{f\epsilon} \gamma^{d\epsilon}$, where α and β are the transmission co-efficients of air and vapour, each of one inch pressure, γ the transmission co-efficient for dust haze of one-tenth of the density observed in May, ϵ the atmospheric thickness traversed by the rays at noonday compared with the vertical depth of the atmosphere, and b, f, and d the pressures of air and vapour and the proportion of dust respectively. Remembering that, for the obliquities we have to deal with, ϵ is as nearly as possible equal to the secant of the zenith distance, we may for purposes of calculation put the equations into the form :—
$\log R = \log S + b \sec. z \log \alpha + f \sec. z \log \beta + d \sec. z \log \gamma$, and the equations for the nine months are more than sufficient to determine all the unknown quantities.

The observations of Mr. Hennessey at Mussoorie and Dehra in 1869 and 1879, however, probably give more accurate values for the transmission co-efficients of air and water vapour than could be determined in this way, and I therefore adopt them now. These values (*see* P. R. S., No. 219, 1882, page 435) are :—

$$\alpha = \cdot 998555$$
$$\beta = \cdot 72783$$

Inserting these in the equations for the nine months, we find $\gamma = \cdot 99449$ and $S = 82^\circ \cdot 29$.

The value of γ shows that in May, when the dust haze is a maximum and the sun's rays nearly vertical, the absorption by dust does not much exceed 5 per cent. This result is probably only brought about by the circumstance that the reflection from dust particles in all directions round the thermometer bulb is nearly equal to the absorption by those particles which lie in the direct path of the solar beam, but it suffices to show that any error of moderate extent in estimating the proportionate quantity of dust for a given month or year will have little effect on the computed value of the solar constant. The quantity of water vapour in the air can be determined with a considerable degree of exactness, and, when its pressure at the place of observation is about an inch, it absorbs 27 per cent. of the incident radiation. The figures in Table I. can therefore now be corrected for atmospheric absorption as were those in my first paper. The resulting values of the solar "constant," corrected also to the earth's mean distance from the sun, are the following :—

Year.	*Solar Constant.*
1876	82·8°
1877	85·1
1878	85·2
1879	83·6
1880	82·7
1881	81·8
1882	79·6
1883	78·6
1884	80·4
1885	83·1

If these results are to be trusted, they show that, during the cycle of visible change on the sun's surface, there is a cyclical variation of large range in the heat emitted by him, the maximum of emission coinciding with, or perhaps slightly preceding, the phase in which his surface is most uniformly bright, and the minimum coinciding with the phase of greatest disturbance, which is also apparently that of greatest absorption of the photospheric radiation by the sun's atmosphere. For, in 1878, the surface of the sun was less disturbed by spots than in any other year of the ten, while the spots were most frequent and occupied the greatest area in 1883. This conclusion, which, so far as the minimum phase of the sun-spots is concerned, was deducible from the observations published in my paper of 1883, is confirmed by the average variation of the intensity of solar radiation all over India, as deduced in the annual meteorological reports, though probably, on account of the somewhat rough and ready way in which the observations are combined in those reports, the variation is not so uniform as it would be if a more elaborate method of reduction were adopted; it is also confirmed by the variation of temperature all over India and probably in other tropical countries, Köppen having long since shown that the temperature of the torrid zone varies inversely with the frequency of sun-spots; I have also found it distinctly confirmed by a series of ground-temperature observations made at Allahabad, and, so far as evidence collected only on this side of the world goes, it may be considered as fairly established. It is desirable, however, that contemporaneous observations made in America, or in some other distant region, should be investigated with a view to testing the truth of this variation in the sun's heating power; for, though a variation in the direction here indicated seems to me not opposed to anything we know of the constitution of the sun, but rather to be expected from the changes observed on his surface, the antecedent probability is very small that the variation would be of anything like so great a range as that just found, a range from maximum to minimum of about 11 per cent. of the mean heating effect.

XVIII.—*On probable Changes in the Geography of the Punjab and its Rivers: an Historico-Geographical Study.*—*By* R. D. OLDHAM, A. R. S. M., *Deputy Superintendent, Geological Survey of India.*

[Received 30th September ;—Read December 12th, 1886.]

(With a Map—Pl. XIX.)

Introductory.—Of all the problems with which we are brought in contact when we try to unravel the ancient geography of India, none surpass in interest or difficulty those connected with the rivers of the Punjab and Sind. Both interest and difficulty result from the fact that, previous to the advent of the English, all civilization and every invader have entered India from the North-West, and their difficulty from the changes that appear to have taken place in the courses of these rivers during the last three thousand years. It cannot be said that this subject has been neglected by previous writers on the ancient geography of India, but their efforts have mainly been addressed to the identification of towns or countries, and their references to the rivers are often marked by an ignorance, or neglect, of the fundamental principles of physical geology; yet the matter is one on which the geologist must be heard as well as the scholar, for, whatever dependence may be placed on history or tradition, the conclusions that are drawn are only valid so long as they are possible, and no one that has not studied the mode of action of rivers on a geological basis can decide whether any particular change in the course of a river, of which there appears to be historical indication, can or cannot have taken place.*

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* Throughout the following paper, I am largely indebted to the author of an anonymous essay in the Calcutta Review, on the "Lost River of the Indian Desert", (vol. lix, pp. 1—29, understood to be by Surgeon-Major C. F. Oldham). I am indebted to this writer for having first drawn my attention to the subject, for having suggested most of the opinions supported in the following paper, and for many of the references given below. I have, however, except where the contrary is expressly stated, verified them in every case; and, to save wearisome repetition, I must request all who wish to see how little I diverge from the opinions expressed by the writer referred to, and to what extent this paper goes beyond the matter he has treated of, to compare the two, promising that the perusal of the article in the Calcutta Review will prove anything but a waste of time.

I. *On the Ancient Course of the Indus through Sind.*—It is generally supposed, and the supposition is supported by authority, that the Eastern Narra marks an old course of the Indus, and that it was down this now deserted channel that the fleet of Alexander sailed. This supposition has been adopted by General Cunningham in his 'Ancient Geography of India,' where the capital of the king Musikanus according to Strabo, Diodorus, and Arrian, or of the Musikani according to Curtius, is identified with the town known in more modern times as Aror or Alor. He says that the ruins of Aror are situated ".to the south of a gap in the low range of limestone hills, which stretches from Bhakar towards the south for about twenty miles, until it is lost in the broad belt of sand hills which bound the Nára, or old bed of the Indus, on the west. To the north-east it was covered by a second branch of the river which flowed nearly at right angles to the other at a distance of three miles. At the accession of Rajah Dahir in A. D. 680 the latter was probably the main stream of the Indus which had been gradually working to the westwards from its original bed in the old Nára."

Leaving his fleet at Alor, Alexander[*] marched against Oxycanus or Portikanus, or, according to General Cunningham's identification, Larkána, and Sindomána or Sehwan, and from Sindomána he "marched back to the river where he had ordered his fleet to wait for him. Thence descending the stream he came on the fourth day to" a town which the General identifies with Brahmanabad, notwithstanding that by his own confession this lies twenty miles west of the Eastern Nára down which he has just declared that Alexander sailed. General Cunningham's identification of this town, the Harmatelia of Diodorus, with Brahmanabad seems to be satisfactory, but the more thoroughly this is the case the less likely does it seem that the Eastern Narra can mark the course of the Indus when Alexander sailed down it.

But there are more important objections than this. After leaving Harmatelia, Alexander sailed down the river to Pattala, which General Cunningham identifies with the modern Haidarabad, and from thence he sailed to the sea by two different courses, one of which took him to near Karachi, the other to the Ran of Kachh. It seems clear that Alexander's historians placed the head of the Delta at or near Patala, which cannot have been much further from the sea than Haidarabad, for Onesikritus says that all three sides of the Delta were equal[†]; in any case it was below Harmateleia. But as Harmateleia and Brahmanabad are the same, and, as this place lay twenty miles west of the Eastern Narra, the Indus must in some manner have broken westwards from the bed of the Narra and wandered over higher ground. In the text there is nothing to shew that General Cunningham appreciated this difficulty, but in the map a compromise seems to be attempted which, the usual fate of such attempts, can hardly be called satisfactory. I say seems, for in this map—as in all the maps illustrating the work, but more conspicuously in this—an attempt has been made to represent, without any distinguishing mark, both the present and the ancient courses of the rivers. On the map in question (No. IX), the "*Narra R. (ancient course of the Indus)*" leaves the existing course of the Indus about thirty miles north of Aror and flows nearly due south to Jakrao, whence a course is marked running S. W. by Brahmanabad to Patala. From Jakrao, another course diverges to the S. E., and, after reaching the latitude of Amarkot, turns S. S. W. and flows into the Ran—or perhaps into a lake, for it is by no means clear whether General Cunningham supposed the Ran to have existed in Alexander's times—shortly after joining a branch of the Indus which flows S. S. E. from Patala, but whether this eastern line is supposed to mark an ancient course of the Indus or to represent the dry bed of the Narra is not clearly shewn, but either supposition would be equally impossible. The accounts of the Arab historians and geographers shew that from the 8th century the Indus flowed past Mansura, until, in the 13th century, it abandoned this course for one further to the west, which it has since maintained, and the supposition that the Eastern Narra marks the ancient course of the Indus lands us on one of the horns of a dilemma, for, if the Indus flowed down the Narra as far as Jakrao, and the present continuation was then in existence, it is inconceivable that the river should have left this lowland to wander up hill, through the higher land to the west; nor, if this line is meant to represent the present channel of the Eastern Narra, which did not exist in Alexander's time, is it possible satisfactorily to explain the excavation of this channel. I have not written the above in any spirit of captious criticism, but merely to shew the difficulty that attaches to the elucidation of the ancient geography of Sind if we accept the prevalent idea, inconsistent as it is with the known principles of physical geography, that the Eastern Narra represents an ancient course of the Indus.

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[*] Cu[illegible], *Ancient Geography of India*, p. 267 *et seq.*

[†] C[illegible]ity, *op. cit.*, p. 283.

§ 2. The Indus in its course through Sind flows between banks that are raised above the general level of the country, which slopes away on either side. This is a feature common to all rivers which are raising the level of their alluvial plains by the deposit of silt, but, at Bukkur, the Indus exhibits a feature which is exceedingly rare, if not without a parallel, in the case of any other river, for here it f[illegible] at the higher level through a gap in a low range of hills surr[illegible]ed on either side by alluvium at a lower level than that of the river where it passes through the gap. It is difficult to give any satisfactory explanation of this feature if we suppose the Indus to be the only river that ever flowed in this region, but I hope to shew that there are both historical and geographical indications of the former existence of a river which flowed to the Ran of Kach, independent of the Indus, and, if we admit its existence, the following hypothesis may he offered as a possible explanation of the existing peculiarity in the course of the Indus.

In former times, the Indus wandered over the plain which surrounds the Khairpur hills, raising the level of the soil on either bank till it broke away into the low ground on one side or the other, and so by degrees raising the level of every part; during the latest phase of this process, previous to the origin of the existing conditions, it flowed east of its present course and, having raised the level of the ground there, wandered away westwards; by this time the surface of the alluvium had been raised till it was level with a gap in the Khairpur hills at Rohri, and, as the alluvium south of the ridge would probably be at a considerably lower level than on the north side, the waters of the Indus, having once found an outlet through this gap, would soon establish a permanent course for themselves. If then we assume that the other river instead of depositing silt and raising the level of its alluvium was an eroding stream, we may suppose that it gradually worked westwards till it reached the present situation of the Eastern Narra and excavated that channel: the flood waters from the Indus would smooth off the slope between them, and, had the process continued, there can be little doubt that the Indus would soon have broken away into this low lying channel, had not the other river, owing to a change of course in its upper reaches, dried up before this happened. It may seem strange that two rivers should have flowed so close to each other under such different conditions, but it must be remembered that, if the second river was small in comparison with the Indus, it may well have deposited all its silt higher up its course, and consequently have had none to deposit when it reached the latitude of Rohri.

So far I have merely proposed a possible hypothesis to account for the known peculiarity of the course of the Indus, but I hope to be able to shew that there is both historical and geographical evidence of the former existence of this second river.

§ 3. The commonly accepted opinion that the Eastern Narra marks the former course of the Indus is no doubt due to a prevalent tradition to that effect among the natives of the country; but it must be borne in mind that these traditions often arise from an endeavour to explain known phenomena, and that when they have their origin in historical fact, this has become so modified by the alteration inherent in oral transmission, not to mention that resulting from a change from prose to verse, that it is impossible to separate the original foundation of fact from the superstructure of fable. Nevertheless, as no tradition ever arose without some foundation in fact, whether an historical occurrence or a phenomenon requiring explanation, these legends must not be neglected, but rather regarded as valuable hints as to the direction that research should take, although they can never be appealed to as proof. But even legend throws some doubt on the correctness of the common idea, if we may believe the following quotation from the Tarikh-i-Tahiri. After mentioning the size of the ruins of Muhammad Tur, the capital of the Sumra chiefs of Sind, he gives the following account of its destruction: "The cause of the ruin of the above-named city and its dependencies which had flourished between 900 and 1000 years was as follows. Below the town of Alor (Aror) flowed the river of the Panjab which was known as the Hákra, Wahind, Dahan, and by others, for it changes its name at every village by which it flows, after fertilising the land the river poured its waters into the sea." The legend then goes on to say how, as a result of the oppression and lust of Delu Rai, who ruled all the land between the capital and Aror, the Hákra was diverted into the present bed of the Indus.* This exhibits the legend in a form slightly different from that which it now takes; and the mention of Muhammad Tur as well as the names of the river, Hakra, Wahind, and Dahan, none of which are applied to the Indus, but all of which are applied to a dry river bed further east in which the Indus has certainly not flowed within the historic period, all points to the conclusion that the legend originally referred to the drying up of that second river whose existence I have hypothetically inferred. The change that has come over it is easily understood, for to this day part of the flood waters of the Indus find their way into the deserted bed of this river; and, when the memory of the co-existence of the two had passed away, what more natural than to suppose that what had occurred was an alteration in the course of the Indus, which, as usual, came to be attributed to the vices of the ruler of the country so laid waste.

This supposition also fits in with a tradition which, according to the writer just quoted,† is prevalent, on the borders of Bikaner, to the effect that the waters of the Hákra spread out into a great lake at a place called Kak, south of the Mer country. No place of the name of Kak is now known, but we have Kachh, which may be it, and the early Arab Historians mention a piratical tribe, the Kerks or Kurks, who appear to have inhabited the shores of the Indus Delta and Kachh; but, however this may be, the Mers are well-known as a tribe formerly inhabiting the south-west corner of the Indian Desert to the north of the Ran of Kachh, which doubtless is the great lake referred to in the tradition.

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* Calcutta Review, LIX, 20.

† Calcutta Review, LIX, 17.

Neither the historians of Alexander the Great's invasion of India nor the classical geographers throw any real light on this question. Ptolemy is doubtless the fullest and most complete in his list of localities, but the modern representatives of most of his towns are as yet a matter of dispute. If General Cunningham is right in identifying the Mousikanos of Arrian with Aror, it would support the generally-accepted theory, for Ptolemy places Sousikanos, which is evidently the same place, west of the Indus; it seems to me, however, more probable that the Kamigara of Ptolemy, which he places east of the Indus, occupied the position known in later days as Aror. The ruins of this city are still known in the neighbourhood as Kaman, and this with the affix *nagar* might easily be corrupted into Kamigara.*

From the date of Ptolemy's geography we lose all sight and knowledge of Sind until the advent of the Arab geographers and historians in the eighth century, from whom some information can be gained as to the course of the rivers in their times.

Unfortunately, the works to which one would naturally first turn are useless, or, worse still, misleading. The Arab geographers had all a very vague and general idea of Indian geography, indeed their works compare ill with our modern knowledge of Central Africa or of that *terra incognita* Central Thibet, their distances are vague and often inconsistent, their bearings are seldom correct, and, to make confusion worse confounded, they were constantly confusing places which had similar names though distinct and distant from each other—a mistake rendered easy by the character in which their books were written, and which betrays itself constantly in the fact that hardly ever do two different authors spell the same name similarly.

Of all the geographers quoted in Sir H. Elliot's History of India but two mention on which side of the Indus the town of Aror was situated: Al Masudi says that it was on the west bank of the Indus,† and Al Idrisi says that the Mihran runs to the west of Dur (Aror).‡ The contradiction here is apparent, not real, for strangely enough all the bearings given by Al Idrisi have been reversed,§ yet I cannot help thinking that in this case his statement is really correct, though constructively wrong. In the extract from Al Istakhri it is merely stated that Alrur is situated 'near the Mihran,' but, in the map reproduced by Prof. Dowson* and extracted from the Askkálu-l Bilad (a copy of Ibn Haukul's work), Alrur is clearly placed on the east bank of the Indus, on the same side as Multan and the opposite side to Sadusan and Makran. This map is said to be very similar to that of Al Istakhri, as published by Moeller, and may be regarded as probably more trustworthy than the text, into which clerical errors are so easily introduced.

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* *Ancient India as described by Ptolemy*, &c., by J. W. McCrindle, M. A., M. R. A. S., London, Calcutta and Bombay 1885, p. 151.

† Elliot's *History of India*, edited by Prof. Dowson, I, 23.

‡ Elliot, *op. cit*, I, 79.

§ Thus he places the Persian Gulf east of the Delta of the Indus and Sewestan or Seistan, north of Turan.

But if the geographers can give us no definite information on this subject, we can at least obtain a fairly certain answer from the historians, for, in the Chachnama,† it is stated that Chach set out from Alor and after many marches reached the fort of Pabiya "on the Biyah," after capturing this fort he crossed the Biyah, and, having passed the Ravi, reached Multan: the same itinerary is given for Muḥammad Kasim's later march over the same country both in the Chachnama and by Al Biláduri,‡ and it is certain that the passage of the Indus, had it been crossed, would not have been omitted by a chronicler who was careful to mention the much smaller rivers of the Bias and Ravi. In the case of Muḥammad Kasim, the passage of the Indus at Nirun is recorded, but there is no record of his recrossing it before reaching Aror.

This should be sufficient proof that the Eastern Narra has not been the bed of the Indus, at any rate since the eighth century, but this opinion is so widely held and has been so supported by authority that it will not be amiss to bring forward still further evidence pointing in the same direction.

The Arab geographer Al Idrisi places the head of the Delta, or the place where the first distributory is given off, at Kállári, 'a hard day's journey' of forty miles from Mansura. The exact words of the translation are "at Kállári it divides—the principal branch runs towards Mansura, the other flows northwards (southwards) as far as Sharúsan it then turns westwards (eastwards) and rejoins the chief stream forming henceforward only one river. The Mihran passes on to Nirun and then flows into the sea."§ Further on it says, "Kállári on the west (east) bank of the Mihran is a pretty town well fortified and is a busy trading place. Near it the Mihran separates into two branches; the largest runs towards the west (east) as far as the vicinity of Mansuria which is on the west (east ?) bank; the other runs towards the north-west

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* Elliot's *History of India*, I, 32.

† *Op. cit*, I, 140.

‡ *Op. cit.*, I, pp. 122 and 202-3.

§ Elliot, *op. cit.*, I, 78.

(south-east) then to the north (south) and then towards the west (east). Both unite at the distance of about twelve miles below Mansúria."* It will be noticed that the bearings in these two accounts do not agree, probably in the second case we should be satisfied with turning them three quarters of a semicircle, but even then they would not cut in, and in consequence the first set, which are more consistent, must be regarded as more nearly correct; any way it is clear that the river bifurcated at a place called Kállári, forty miles or a 'hard day's journey' from Mansura, that one branch flowed by Mansura, and that the two reunited below Mansura.

At the conclusion of the second account he says that from Kállári to Sharúsan is three days. I refer to this now as the statement is puzzling, but is due to the confusion of two places of very similar names, Kállári and Bállári. On Ibn Haukal's map the town at the bifurcation of the river is called Ballari while Kalari is further north and at some distance from the river. In the text he says that Ibn and Lábri—which Prof. Dowson identifies with Amári and Kállári—are situated east of the Indus, but distant from it. Al Idrisi's two accounts are evidently from different sources, and it is probable that either he or his informant must have confused the Bállári, or Kállári, at the bifurcation of the Indus with the other town of similar name situated to the east, which might well be three days distant from Sehwan.

The first account too is somewhat difficult of understanding, for it is impossible to understand how, from any point one day's journey—even if it be one of four miles—from Mansura, a branch of the Indus could flow south to Sehwan. It is of course a physical impossibility that the Indus should have flowed any distance northwards, and the general reversal of Al Idrisi's bearings has already been referred to. No other authority makes this statement, and the map of Ibn Haukal places Sadúsan on the west bank of the Indus above Bállári, where the river bifurcates; this is altogether a more probable disposition.

We have thus two authorities confirming each other that in the tenth or eleventh century the Indus or a branch of it flowed passed Sadúsan, which we may certainly identify with Sehwan. The Chachnáma seems to shew that the same was the case in A. D. 713, for it says that, when Muḥammad Kasim besieged Siwistan (Sehwan), the river "Sindhu Ráwal" flowed north of his camp.† There can be little doubt that this was either a bend or a branch of the Indus.

It is thus clearly proved that at any rate since the commencement of the eighth century of our era the Indus has flowed west of Aror and the range of hills running southwards, and that, though it is practically certain that the Indus, or one branch of it, must have at one time flowed through the gap near Aror, it is equally certain that nothing but the flood waters then or since have flowed eastwards past Aror to the Narra, and that for the last 1100 years at least the Indus flowed west of the low range of hills running southwards from Sukkur and Aror. The tract of country between these hills and the range to the west is on the map a simple network of deserted river channels, and it will be hopeless to attempt to determine with accuracy which of these was the river course at any one particular period.

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* *Op. cit.*, I, 79.

† Elliot, *op. cit.*, I, 159.

§ 4. Yet, though the Eastern Narra is not a deserted bed of the Indus, it seems probable that as late as the eleventh century it was occupied by a flowing river. My witnesses to prove this are, 1*st*, the Chachnama, and, 2*nd*, the Beglarnama, both translated in the first volume of Prof. Dowson's edition of Sir H. Elliot's History of India.

When Muḥammad Kasim invaded Sindh, he sent his mangonels up the river to Niran, and, after receiving the submission of that place, he determined to go against Sehwan, and after its capture to "recross the river"* and proceed against Dahir; from this it is evident that he must have crossed one of the main branches of the Indus, thus confirming other accounts which place Niran between the two main branches of the Indus. After the capture of Sehwan, he returned to Niran, where he crossed the Mihran by a bridge of boats, and went against Dahir; after crossing the river and defeating Dahir's troops, whom they pursued 'as far as the gates of Jham,' the Arab army marched on till it reached 'the fort of Bait,' where an entrenched camp was formed. Muḥammad Kasim then advanced towards Ráwar and came to a "lake," but, as this had to be crossed by a boat, it was probably a branch of the river; after crossing he advanced a day's march and came to "Jewar on the banks of the Wadhawah (or according to another MS. Dadhawah").† After his defeat by Muḥammad Kasim, Dahir took refuge in the fort of Ráwar, which was but a day's march from 'Jewar on the Wadhawah,' and which seems itself to have been on the Wadhawah, for, among the administrative arrangements made by Muḥammad Kasim before he marched northwards, it is stated that he placed "Nuba, son of Dáras, in the fort of Ráwar and directed him to hold the place fast and keep the boats ready. If any boat coming up or down stream was loaded with men or arms of war, he was to take and bring them to the fort of Ráwar."‡ From this it is evident that Ráwar was on a navigable stream, and it remains to identify this if possible.

Elphinstone has placed Ráwar on the Indus, but this was clearly not the case, for it was several marches east of the Indus, three halting places being mentioned in the Chachnama, and the context clearly shewing that these were separated by more than a single stage; besides which the text says that, when it was known that Dahir had been killed "between the Mihran and the Wadhawah," the chiefs and officers of the Rani "took refuge in the fort," thus clearly shewing that, in the opinion of the writer of the chronicle, the Mihran and the Wadhawah were not one and the same river. This would perhaps be of little value if unsupported, but, on examining the latest maps of Sind, I find that the Narra can be traced northwards to Sahara in Lat. 27° 15, where it ends abruptly, that thence for twenty-three miles its course is obscured and obliterated by the deposit from the flood waters of the Indus: but, in Lat. 27° 25′, Long. 69° 18′, I find a deserted river channel, called on the map the "dry bed of the river Wundun," which is continuous with the dry bed of the Hákra, traceable through Bhawalpur and Bikanir. This similarity of name certainly lends great support to the theory, originally started by the anonymous writer in the '*Calcutta Review*,'* that the Nárra is the old bed of the Hákra which till the thirteenth century pursued an independent course to the sea.

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* Elliot, *op. cit.*, I, 158.

† *Op. cit.*, I, 168.

‡ *Op. cit.*, I, 189.

Further evidence of the existence of another river besides the Indus in this region may be found in the Chachnama, where it is related that, on the way from Ráwar to Brahmanabad, Muḥammad Kasim laid siege to the fort of Dhalila, and "when the besieged were much distressed * * * they sent out their families into the fort which faces the bridge, and they crossed the stream of the Naljak without the Musalmáns becoming aware of it." At daybreak they were pursued and overtaken as they were crossing over "the river" and "those who had crossed previously fled to Hindustan through the country of Rámal and the sandy desert to the country of Sir, the chief of which country was named Deoraj." But far more important and convincing evidence is to be found in the Beglarnáma. It is there related that, after an embassy to Jessalmer, Khán-i-Zamán (the hero of the chronicle) went towards Nasrpur, and, in the course of his journey, it is incidentally mentioned that he crossed 'the tank Sankra.'† At Nasrpur, being pressed for money, he determined on a marauding expedition against the "Sodhas at the village of Tarangchi." He set out and "crossed the waters of the Sánkra," and "when Dúda and Ghází learnt that he had gone in that direction they rode after him;" but these youths had forgotten to ask the permission of their parents, who rode after them hot haste and reached the Sánkra just as their sons were crossing it; the latter, when they saw that their fathers had come after them, immediately "threw themselves into the stream, swam their horses over, and joined Khán-i-Zamán."*

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* Notes on the Lost River of the Indian Desert, *Calcutta Review*, LIX, 1—27.

† Elliot, *op. cit.*, I, 284.

The Sánkra here is evidently what we now call the Narra, and the name given is the same as Hákra or Sákra, which is applied to the dry bed of the lost river in Rajputana, while the mention of the horses swimming the river shews that this must have been of some depth, quite sufficient to be navigable for country boats.

It seems then that, as late as the beginning of the eleventh century, the Eastern Narra was occupied by a considerable stream of water, and was known as the Hákra, Sákra, Wandan, Dahan, Wadhawah, Dadhawah, or Wahind. These names really resolve themselves into three. Hákra or Sákra is the name still applied to the dry river bed which can be traced through the Western desert, where the letter S is almost invariably changed to H. The next four are also one word, D and W being easily confounded in the character in which these chronicles were written, and the termination 'wah' simply meaning a stream. While the last appears to be a separate name which translated means the "river of Hind," a name which appears of itself to separate this river from the Mihran, the "river of Sind" now known as the Indus. But I have already shewn that the Indus must have flowed west of Aror since the beginning of the eighth century, so that there is little difficulty in accepting the conclusion that the Eastern Narra marks the course of a dried up river which can be none other than that which the names applied to it indicate, the "Lost River of the Indian Desert."

II. *The Lost River of the Indian Desert.*—We lost sight of the dry bed of the old river Wandan in Lat. 28° 16′, Long. 70° 33′. Above this comes a stretch of sixty miles in which the river bed has either been completely obliterated by drifting sand or at any rate is not marked on the Revenue Survey maps of Bhawalpur, but in Lat. 28° 46′, Long. 71° 25′ we again find a dry river bed which, under the varying names of Hakra, Sotra, Choya, &c. can be traced through Bhawalpur, Bikanir, and the Sirsa district till it is lost near Tohána in the Hissar district.

Although the connection of these two dry river beds has not yet been traced (unless we may take a passage† in the essay which has more than once been alluded to to mean that the writer had personally traced the connection), there can be but little doubt that the two were originally continuous and are the sole remaining traces of that great river which, according to the traditions prevalent throughout the desert, once flowed through this now barren tract to the sea, or, according to other accounts, to the Indus at Sukkur.

* *Ibid*, p. 285.

† *Calcutta Review*, LIX, 17, (1874).

As regards the date of the final drying up of this river the only evidence we have is the couplet, quoted by Col. Todd,[*] which says that the river dried up in the time of the Sodah prince Hamir. A prince of that name was contemporary with the Bhatti rajah Doosaj who ascended the throne of Jessalmer in A. D. 1044: there is no proof that this was the same Hamir as is referred to in the couplet, but we have already found that the latest mention of the Hákra or Sánkra[†] as a flowing river is about 1000 A. D., and that it is not mentioned in any contemporary record of later date; it is, consequently, possible that the two Hamirs are one and the same, and that the drying up of this lost river took place some time during the eleventh century.

§ 2. We have next to decide from whence came the water that filled this river bed; the first hypothesis that may be mentioned is that of M. de Saint Martin. He considered that it was the Saraswati of the Vedas whose course had been shortened to its present limits through a diminution of rainfall. This hypothesis is, however, untenable, for there is no historic evidence of such an enormous climatic change as this implies, nor could such an enormous rainfall on the Himalayas have existed during the human period without leaving its traces in the boulder deposits of the streams where these issue from the hills on to the plains.

Another theory, propounded by an anonymous writer in the Calcutta Review,[‡] is that the Hakra was originally occupied by the Jumna or a branch of it. Whether it may ever have carried any of the waters of the Jumna, I will afterwards consider, but it is certain that it could not have done so since the time of Manu, who mentions the Jumna as joining the Ganges at the modern city of Allahabad; and I have shewn that the Hakra was probably a flowing river at a later period than that.

The third, and to me most probable, theory is that of the anonymous essayist[§] whom I have already quoted several times and shall quote still oftener, and who supposes the Hakra to be the old bed of the Sutlej, which, previous to the thirteenth century, did not join the Beas, as it now does, but pursued an independent course to the sea.

This hypothesis was warmly combated by another anonymous writer in the same periodical, and it will be convenient before passing on to the evidence in its favour to consider one argument which has been urged against it by the writer just referred to, and again by Mr. Wilson in his final report on the settlement of the Sirsa district, *viz.*, that the Hakra is not large enough to have carried the waters of the Sutlej. I will quote Mr. Wilson's own words: "The Sotar is a well-defined valley, varying in width from three to six miles, of no great depth, and usually quite level from side to side, but distinctly marked off from the light-coloured loamy soil of the plain through which it passes by a clearly defined bank or sand-ridge on either side, and still more by its dark rich clay soil free from admixture of sand and producing a vegetation different in character from that of the surrounding country." * * * "From the appearance of the Sotar valley and the numerous remains of towns and villages which stud its banks all the way to Bhawalpur,* it is evident that at one time it conveyed a much larger volume of water than at present, and probably was the channel of a perennial stream. But though it must have been, as it is now, the largest and most important of all the drainage channels between the Sutlej and the Jumna, it can never have carried a river at all approaching in size to either of these two. The valley is too shallow and shews too few marks of violent flood action for this to have been the case; and there is none of the river sand which would certainly have been left by such a stream. The soil is all rich alluvial clay, such as is now being annually deposited in the depressions which are specimens of those numerous pools which have given the Saraswati its name, 'The river of Pools'; and there seems little doubt that the same action as now goes on, has been going on for centuries, and that the numerous mountain torrents of the Indo-Ganges watershed, fed, not by the snows but by the rainfall of the Sub-Himalayan ranges, wandering over the prairie in many shallow channels, joined in the Sotra or Hakra valley and formed a considerable stream, at first perhaps perennial but afterwards becoming absorbed after a gradually shortening course, as the rainfall decreased over the lower Himalayan slopes, and as the spread of irrigation in the submontane tract intercepted more and more of the annual floods; and the comparatively feeble stream, cutting away all the prominency in its bed, deposited the silt in the depressions, and gradually filled its valley with a level layer of rich hard clay. The same process appears to be still going on, and the bed of the stream is gradually attaining one uniform slope throughout."†

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[*] Annals of Rajasthan; a sketch of the Indian Desert, chapter I.

[†] These are the same word, many of these Western Rajputs being unable to pronounce the letter S.

[‡] *Calcutta Review*, LX, 351, (1875).

[§] *Ibid*, LIX, pp. 1—27, (1874).

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* Mr. Wilson had traced its course outside the Sirsa district on native authority into the Garrah near Bhawalpur. Actual survey has shewn that this information was erroneous.

† *Final report of the Revision of the Settlement of the Sirsa District in the Punjab*, by J. Wilson, Settlement Officer, Calcutta, 1884.

I have quoted this passage as giving a clear statement of the nature of the objection raised, *viz.*, the shallowness of the channel and the difference of its soil from the sandy silt found in the present bed of the Sutlej, and at the same time describing the manner in which it is even now being filled up with an alluvium precisely similar to the existing soil, and different from the sandy silt of the present bed of the Sutlej, thus destroying the objection just urged so forcibly. There is no evidence of the progressive diminution of rainfall assumed by Mr. Wilson, but the other reason—the extension of irrigation—would certainly absorb an increasing proportion of the water, and may account for the fact that the waters of the Gaggar appear to have reached further down this channel about the commencement of the present century than they now do.

Another objection which has been raised is, that the Sutlej flows in a depression below the level of the plain over which the Sotar pursues its course, and that neither it nor any of the dry river channels, to be mentioned further on, which communicate with it have been traced into connexion with the Sutlej. As regards the first, this is a common characteristic of all the rivers of the Indo-Gangetic plain, and it is certain that, as long as the present conditions existed, it would be impossible for any great changes in their courses to take place. But it is equally certain that, when these plains were being formed, the rivers must have wandered over them in channels raised above the general level of the surface, and were consequently liable to constant change of course, and that the present configuration is due to a change of conditions, from one of deposition to one of erosion by the rivers, the exact date or cause of which has not been established.

With regard to the second objection, it implies an ignorance of the conditions under which rivers flowing over an alluvial plain may change their course. In such cases rivers flow in places in a single well-defined deep channel, but in others they spread out over a shallow ill-defined bed or even split up into several distinct channels; it is at such places as this that a river is liable to break away into lower ground on either side, the shallow channel becomes obliterated and gradually merges into the general level of the plain, but lower down, where the river flowed in a deeper and better defined channel, the dry bed remains distinguishable and marks the former presence of the river.

§ 3. We must now consider the historic evidence in favour of or against the supposition that there have been extensive changes in the course of the Sutlej during the historic period.

In the Vedas, the Sutlej is several times mentioned under the name of Satadru, but only in one case is it mentioned or supposed to be mentioned in connection with the Beas, and that is the 33rd hymn of the 3rd Mandala, where the confluence of the Chutudri and the Vipas is referred to; there are, however, some points in the description which render it open to doubt whether this refers to the confluence of the Sutlej and Beas, and, moreover, it would not prove that the Sutlej did not pursue an independent course at a subsequent period, unless we could also prove that the present configuration of the ground, the distinction of Khadir and Bhangar, of strath and upland, existed in Vedic times.

Coming to a later period, we do not find the Sutlej mentioned by any of the classic historians or geographers. In Arrian's Anabasis there is no mention of the Sutlej, though all the rivers, from the Indus to the Beas, are mentioned, and, in the description of his voyage down the Jhelum and Indus, we find the statement that "these four large and navigable streams at last discharge their waters into the Indus, though they do not preserve their individual names until that time. The Hydaspes falling into the Akesines loses its name there, the Akesines takes in the Hydraotes and also the Hyphasis, and retains its name until it falls into the Indus."* Here not only is there no mention of the Sutlej, but the special mention of *four* rivers shews that there was no information extant of the existence of a fifth large river.

In the "Indica" of Arrian some other rivers or streams are mentioned; it is there stated that the "Hydraotes, flowing from the dominions of the Kambistholi, falls into the Akesines after receiving the Hyphasis in its passage through the Astryabai as well as the Saranges from the Kekians and the Neudros from the Attakenoi."†

Ptolemy, however, mentions a river Zaradros which he makes to receive the Bibasis (Beas) much in the same place as the junction takes place at present, and furthermore he makes it preserve its name right to the Indus. He also makes the Bidaspes (Jhelum) preserve its name till it joins the Zaradros, although it receives first the Sandabal (Chandrabagha or Chenab) and then the Adris (Ravi). With the exception of a few slight peculiarities of nomenclature, this is practically the same arrangement as obtains at the present day, if we may regard the Zaradros as the Satadru or Sutlej of modern times; and when we find the greatest of the classical geographers agreeing so closely with our modern maps, we may well begin to doubt whether there has been any great change in the course of any of the rivers since his time.

Ptolemy, however, gives one peculiar piece of geography which must not be passed over without notice; in latitude 29° 30′, or about thirty miles south of the junction of the combined rivers, he places a "divarication of the Indus towards Mt. Ouindion" and the "source of the divarication" in Lat. 27°, Long. 127°. This, allowing for the vagaries of Ptolemy's geography, would agree fairly well with the commencement of the Sotar, and it may be noticed that many maps which profess to shew the ancient geography of India make the "Neudrus" follow the course of the Sotar for some way and join the Indus about where Ptolemy places this divarication. It is not necessary here to enter into a discussion of the exact meaning of that extraordinary phrase of Ptolemy's "ἡ πηγὴ τῆς ἐκτροπῆς," for it is evident that in this matter he was given to a looseness of language, or an inaccuracy of information, which led him to confuse together affluents and effluents, tributaries and distributaries.*

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* *Anabasis*, LVI, CXIV.

† *Indica*, cap. IV, McCrindle's Translation, p. 190.

After Ptolemy, a long night fell upon our knowledge of India, and, when, with the advent of the Arab invaders, the dawn again begins to lift, we find much that is with difficulty reconcileable with Ptolemy's account. We have firstly the marches of Chach and Muḥammad Kasim from Aror to Multan, in both of which the "Biyas" is the first river crossed after leaving Arore, thus ignoring the "divarication towards Mount Ouindion" of Ptolemy; but a far more noteworthy fact is that, throughout the chronicles translated in the first two volumes of Sir H. Elliot's History of India, the name "Biyah" is invariably applied to the combined Beas and Sutlej rivers. It is needless for me to give instances in detail, for they are numerous, and many of them have already been quoted by the anonymous reviewer so frequently referred to.† The only mention of the Sutlej by any of the historians that I can find is in the description of one of Mahmud's campaigns, where he is said to have crossed the Sihun (Indus), Jelam Chandraha, Ubra (Ravi), Bah (Beas) and Satladur (Sutlej); but, as it is also stated that all the rivers bear along with them great stones, he must clearly have crossed them near the foot of the hills, and consequently above any possible confluence of the Sutlej and Beas. Col. Tod, in his Annals of Rajputana, mentions that the same nomenclature is found in the native annals of the state of Jessalmer,‡ which formerly embraced the whole of what is now Bhawalpúr and Sind east of the Indus as far south as Arore.

So peculiar a nomenclature as this of the greater river losing its name in the lesser, where there is no special sanctity attached to the latter, can only be explained on the supposition that the Sutlej originally pursued an independent course, that it afterwards joined the Beas, and that the united rivers below their junction, retained the name which had originally been applied to only one, in this case to the lesser of the two.

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* *Ancient India as described by Ptolemy*, by J. W. McCrindle, M. A., M. R. A. S. London, Calcutta and Bombay, 1885, pp. 91 to 95.

† *Calcutta Review*, LIX, p. 11 *et. seq.*

‡ *Annals and Antiquities of Rajasthan*, footnote to chapter V of the Annals of Jessalmer.

Another indication that the Sutlej was not originally a tributary of the Indus is the existence of the word Panjnad as an old name of the Indus. This nomenclature is mentioned by Tod as occurring in the annals of Jessalmer* and by the Arab geographer Al Biruni, who, writing in the eighteenth century, says that the Sind after passing Audar, (Aror) bears the name of Mihran, and adds, "In the same way as at this place they call the collected rivers 'Panjnad,' so the rivers flowing from the northern side of these same mountains when they unite near Turmuz and form the river Balkh (Oxus) are called the seven rivers." At the present day this term Pānjnad is unknown as a name for the Indus, the corresponding name at present being Satnad, while Panjnad is confined to the Chenab below the confluence of the other rivers of the Punjab, and it seems incredible that so inappropriate a name could ever have been applied had the courses of the rivers been similar to what they now are.

These facts point to the conclusion that the Sutlej was not always a tributary of the Indus, but may have pursued an independent course at any rate to a point much below the junction of the other four rivers, and if this supposition is correct, the natural conclusion is that the Sotar, Hakra, or Wahind marks its ancient course through the Western desert.

§ 4. It remains to be seen how far the physical configuration of the ground supports this supposition. As I have already said, the dry bed of the Sotar can be traced as far as Tohana in the Hissar district, where, as is shewn by the disposition of the minor drainage that issues from the outer Himalayas between the Jumna, the point of junction of the two great fans of the Jumna and Sutlej respectively is situated. Under there circumstances it may have derived its waters originally from either the Jumna or the Sutlej or both.

But the Sotar is by no means the only dry river channel in this region. Between it and the Sutlej there are no less than four other dry river channels, all of which, if any trust may be placed in maps, vary from one to three miles in width, and all of them directly or indirectly join the Sotar. These channels are not marked, on any map I have seen, above where they enter the Sirsa district, but they can all be traced into communication with each other or with the Sotar. The most easterly of these is known as the Wah, and joins the Sotar fifteen miles from Bhatner; the other three are all known as Naiwal; the easternmost of these enters the Sotar near the ancient fortress of Bhatner, while the two westerly Naiwals, after uniting in Lat. 29° 53′, Long. 73° 53′, appear to join the Sotar at Wullur. As I have said, these channels are not marked on any map to the north of the limits of the Sirsa district, but, according to the writer in the *Calcutta Review*, the easternmost Naiwal was traced northwards, during the preliminary survey for the Sirhind canal, to Chumkour, ten miles from Rupar, the point where the Sutlej leaves the hills. The next of the Naiwals enters the Sotar at Wullur near the boundary of Bikanir and Bhawalpúr, and has been traced upwards as far as the ancient fortress of Bhattinda, and, in the settlement report of the Ludianah district, there is a reference to an old river bed which may be traced from Muchewara to near Talwandi (fifty miles north-east of Bhattinda) and thence onward to the south-west; in all probability these are continuous. The most western of these Naiwals may be traced upwards past Abohar and Marot, and is said to be clearly defined at the village of Urkara, twenty miles south-west of Ludianah and half that distance from the present course of the Sutlej.*

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* *Annals and Antiquities of Rajasthan*, footnote to chapter I of the Annals of Jessalmer.

None of the maps mark more than a single dry river channel as entering the Sotar from the east, and, on the most recent large-scale maps of the Sirsa district, this is not marked as recognizable in the same manner as the Sotar and the Naiwals; from this we may conclude that it has probably been deserted for a longer period than the latter. This channel is known as the Chitang or Chitrang, and, on the engraved thirty-two miles to an inch map of India, is conjecturally continued, till it joins the lower end of the drainage channel which derives its name from Feroz Sháh, who converted it into a canal by introducing the waters of the Jumna.

It will be seen from this that the old channels connecting the Sotar with the Sutlej are both more numerous and more recent than the solitary one, of any importance, which leads towards the Jumna, and we may conclude that, at any rate in the latest stage of its history, this lost river of the Indian Desert was the Sutlej.

I may add, though it cannot be regarded as evidence of much value, that the traditions of the district declare that these channels were in turn the bed of the Sutlej river.†

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* *Calcutta Review*, LIX, 6.

† *Calcutta Review*, LIX, 6. On the revenue survey maps of Bhawalpúr the words "old bed of the Sutlej" are printed from south to north along the boundary of Bhawalpúr, in the neighbourhood of Wullur.

§ 5. We have now seen that a dry river bed can be traced, practically continuously, from Tohana in the Hissar district to the Eastern Narra in Sind. We find that the drying up of this river cannot be due to diminished rainfall, and that we must consequently look to either the Sutlej or the Jumna for its supply; and, as the latter of these has been known to flow in its present course from the time of Manu downwards, while tradition and history alike point to the lost river having flowed at a much later date than this, we are perforce compelled to look to the Sutlej. We have seen that the supposed mention of the confluence of the Sutlej and Bias in the Vedas is not conclusive; that, though Ptolemy seems to take the former river into the latter much as is now the case, yet, when we come to the time of the Arab invaders of India, we find a peculiar nomenclature of the river, which points to the conclusion that the Sutlej can then only recently have become a tributary of the Bias and so of the Indus; and, moreover, we find a number of dry river channels, all of which lead from within a few miles of the present channel of the Sutlej, and ultimately join the dry bed of the lost river. Taking all these points into consideration, we may well conclude that this Lost River of the Indian Desert was none other than the Sutlej, and that it was lost when that river turned westwards to join the Bias.

III. *The Saraswati of the Vedas.* Probably the most difficult of all these problems relating to the rivers of Northern India is the persistent reference, in the Vedas, to the Saraswati as a large and important river. It is impossible to suppose that rational beings would have selected the insignificant streamlet, now known by that name, whose bed contains no water for a large portion of the year, to associate it on equal terms with the rivers of the Punjab and the Indus, still less to exalt it above them all, to describe it as "chief and purest of rivers flowing from the mountains to the sea", or as "undermining its banks with mighty and impetuous waves." The only conclusion open to us is, then, either that there has been some great change in the rivers of this region, or that the Saraswati of the Vedas has no connection with the insignificant streamlet which we now call by that name.*

The latter of these two is the opinion adopted by Mr. E. Thomas† in an essay on the rivers of the Vedas. According to him, a part of the ancient Aryans, after leaving their native country at the head waters of the Oxus, remained for some time in the valley of the Helmund, references to which were incorporated in their sacred hymns. After a while they were again compelled to migrate, and, on reaching the Punjab, tried to revive the seven rivers of their original home; unfortunately, however, there were only six large rivers, but the Saraswati being a stream that lost itself in the lake or tank of Kurukshetra reminded them in a manner of the Saraswati they had left behind them, the name was transferred to it, and thus the seventh river was found. In favour of this hypothesis may be mentioned the fact that, in the Zend, the Helmund is called the Haraquaiti, a word identical with the Sanskrit Saraswati, according to the recognised rules of transliteration, but there is little else that can be produced in favour of this highly ingenious but far-fetched hypothesis. It implies an almost incredible degree of childishness in the ancient Aryans to suppose that they would confuse together a petty streamlet and a large, navigable river simply for the reason that the one ended in a large lake, while the other flowed into a tank or *jhil*.

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* I have already shewn that this change cannot be due to diminution of rainfall.

† *Jour. Roy. As. Soc.*, XV *(new ser.)*, pp. 357—386 (1883).

§ 2. Rejecting the ingenious explanation of Mr. Thomas, there is no alternative but a considerable change in the hydrography of the region. We may at once dismiss all suggestions of any possible change in the number or position of the large rivers within the limits of the Himalayan region; and, as all the rivers of the Punjab are accounted for, we need only consider whether the Jumna, or a portion of its waters, flowing in a channel different from the present one, may not have been the Saraswati of the Vedas.

The configuration of the ground west of the high bank of the Jumna is that of a very broad and gently sloping cone; this is clearly shewn by the general directions of the minor watercourses west of the Jumna, which, as a glance at a sufficiently large scale map will shew, radiate from the point where the Jumna leaves the hills. This feature can only have been produced by the Jumna itself, like the Sutlej, though now flowing in a depression below the general level of the plains on either side, having once flowed over their surface. The Jumna must, consequently, during the period which geologists call recent, have flowed sometimes into the Ganges and sometimes through the Punjab; but it is not possible for geology pure and simple to give the exact date at which the Jumna last changed its course.

Two of these now minor drainage channels, the present Sarsuti and the Chitang, are continuous with the Sotar, and die out after approaching within a few miles of the old high bank of the Jumna; and it is not impossible that one or the other may mark approximately the course of the Jumna, or Saraswati, of the Vedic period.

In this connection, a coincidence may be mentioned which is perhaps germane; when, about the commencement of the century, the Brahmaputra, a sacred river like the Saraswati, broke away from its old course and flowed west of the Madhopur jungle to join the Ganges, the new channel thus formed was immediately christened the Jamuna, a name it retains to this day, while the old channel now deserted by the main stream is still known as the Brahmaputra. Possibly, a similar explanation may be assigned to the name of the Jumna, which, originally known as the Saraswati, struck out a new course for itself during the Vedic period and, doing so, acquired a new name. If this be so, the native tradition that the old Saraswati joins the Ganges at Allahabad is, unwittingly, a true statement of fact.

The most weighty, and indeed almost the only, argument that can be urged against this hypothesis must be derived from the mention of both the Saraswati and the Jumna in the Vedas, and even in the same verse of the same hymn. It may have been, however, that the Jumna, after leaving the hills, divided its waters, as the Diyung does even now in Assam, and that the portion which flowed to the Punjab was known as the Saraswati, while that which joined the Ganges was called the Yamuna. Possibly this was the hydrography of the country when the Aryans entered India, but the name Yamuna seems to indicate that the easterly flow of the Jumna was established subsequently to their arrival; the silence of the Vedic hymns on this point is not an objection of importance, for the geographical references they contain are few and far between, almost invariably incidental, and seldom go beyond the mere mention of a name.

The above is confessedly but an hypothesis, and is probably incapable of proof or disproof, yet it is one which has been proposed by Mr. Fergusson, who, if not a Vedic scholar, was, at any rate, a careful observer of the mode of action of rivers, and whose essay on the delta of the Ganges is still the standard authority on the physiography of rivers flowing through alluvial plains. If not true, it is at least a possible explanation of the difficulty whose solution is by no means a matter of purely antiquarian interest, for, if the explanation I have put forward is the true one, it is evident that the present distinction between *bhangar* and *khadir* has originated since the Aryan immigration, and, as it is hardly probable that there has been a sufficient change of level since then to account for the erosion by the rivers which has taken place, we must suppose it to be due to the extension of cultivation in the hills, which, by causing the rain to flow more quickly off the hill-sides, has augmented the violence, and consequently the erosive power, of the rivers when in flood, and thus caused them to lower their channels into the plains over which they flowed.

§ 3. It may perhaps be thought that there is some inconsistency in thus claiming the Sotar first as an old course of the Sutlej and then of the Jumna, but this is apparent, not real, for, as I have pointed out, the Sotar takes its rise where the fans of these two rivers meet, and must, as long as they were building up the deposits they are now excavating, have constantly been receiving a supply of water from one or other of the two. It so happens that the last change of course of both rivers, previous to that change of condition which led to their excavating the existing depressed channels, took the one into the Beas, the other into the Ganges, and a dry bed is all that remains of what was once a large river flowing through a fertile land.

Conclusion.—I have now shewn that we may take it as proved that there have been great changes in the hydrography of the Punjab and Sind within the recent period of geology, that there are abundant indications, not amounting to proof, that these changes have taken place within the historic period, and that the most important of them, by which a large tract of once fertile country has been converted into desert, appears to have taken place after several centuries of the Christian era had sped. It is hopeless to expect an authoritative settlement of the question; the physical conditions cannot be said to favour the idea, but they are far from being inconsistent with so recent a drying up of the "Lost River of the Indian Desert."

XIX.—*List of the Lepidopterous Insects collected in Cachar by* MR. J. WOOD-MASON, Part II,—RHOPALOCERA.—*By* J. WOOD-MASON, *Officiating Superintendent of the Indian Museum, and Professor of Comparative Anatomy and Zoology in the Medical College, Calcutta; and* L. DE NICE'VILLE, F. E. S.

[Received and Read November 2nd, 1886.]

(With Plates XV—XVIII.)

Only one short paper on the Rhopalocera of Cachar has hitherto appeared. It is by Mr. A. G. Butler, and it was published in the Transactions of the Entomological Society of London for 1879. In it but 57 species are recorded, of which four are described as new to science, namely, *Salpinx grantii* (which appears to be nothing more than one of the almost innumerable slight variations of *Euplœa klugii*), *Mycalesis lurida* (which is in all probability a seasonal form of *M. perseus* or a form transitional from the one to the other seasonal form of that species), *Lycæna (Zizera) squalida* (to which the same remark applies, *mutatis mutandis*), and *Neptis cacharica*, which has not since been recognized by any entomologist, and nothing identifiable with which has been obtained by Mr. Wood-Mason.

From the Independent State of Manipur, which bounds Cachar on the east and is separated therefrom by a range of lofty and precipitous mountains, Mr. Butler has recorded (Ann. & Mag. Nat. Hist., 5th series, vol. xvi, p. 298, 1885) 114 species, many being described as new, and many being from the hills, while all, save a few from Nemotha (a trigonometrical peak 3,634 feet high at the extreme south of the highlands of the district), of those enumerated and described in the following pages were caught in the lowlands of Cachar on either side of a line running nearly directly north and south from the peak just mentioned to Rupacherra close to the Lushai frontier, between 25° 1′ and 24° 24′ north latitude and between 92° 40′ and 92° 52′ east longitude, approximately, chiefly in the forests of Silcuri, Durgakuna, Dhurmkhall, Sildubi, Irangmara, the Doarband-pass, Hasooria or Lalla Mookh, and Rupacherra between the Barak River and the Lushai frontier, and at Dooloo and Subong north of the Barak near the foot of the N. Cachar Hills.

247 species were obtained, affording a good indication of the richness of the region in insect life; but large though this number is—the largest probably that has as yet been published for any portion of India of equal extent—there is little doubt that it might be increased by at least a hundred by an enthusiastic collector stationed in the district for a few years.

The collection, which was formed between March 26th and October 4th, is remarkable for its richness in species of the family *Hesperiidæ*; no less than 53 distinct species of this interesting group having been obtained.

This paper was written in 1881, but its appearance in print has been delayed till now by Mr. Wood-Mason's absence from India on furlough and official engagements and by the preparation of the plates, which have only just been completed.

For an admirable account of the physical features and meteorology of the lovely district of Cachar the reader is referred to the graphic pages of '*A Statistical Account of Assam*' by Sir W. W. Hunter.*

Suborder RHOPALOCERA.

Family **Nymphalidæ.**

Subfamily DANAINÆ.

1. DANAIS (*Tirumala*) LIMNIACE.

Papilio limniace, Cramer, Pap. Ex., vol. i, pl. lix, figs. D, E, *male* (1775).

Common in Cachar, as elsewhere, in April, May, and June.

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* Trübner & Co., London, 1879.

2. DANAIS (*Tirumala*) SEPTENTRIONIS.

D. septentrionis, Butler, Ent. Month. Mag., vol. xi, p. 163 (1874).

Common in Cachar; specimens also taken on Nemotha Peak at 3,300 feet elevation. This species has a more restricted range than *D. limniace*.

3. DANAIS (*Limnas*) CHRYSIPPUS.

Papilio chrysippus, Linnæus, Syst. Nat., ed. x, p. 471, n. 81 (1758).

An ubiquitous insect throughout India.

4. DANAIS (*Salatura*) GENUTIA.

Papilio genutia, Cramer, Pap. Ex., vol. iii, pl. ccvi, figs. C. D, *male* (1779).

A common species, but less wide-spread than *D. chrysippus*, and occurs with it at all seasons.

5. DANAIS (*Parantica*) MELANOIDES.

Parantica melanoides, Moore, Proc. Zool. Soc. Lond., 1883, p. 247, n. 1.

Common in Cachar from April to June, and taken on Nemotha in September and October.

6. DANAIS (*Caduga*) MELANEUS.

Papilio melaneus, Cramer, Pap. Ex., vol. i, pl. xxx, fig. D (1775).

A single male on Nemotha, 2nd October.

7. EUPLŒA (*Penoa*) ALCATHOË.

Danais alcathoe, Godart, Enc. Méth., vol. ix, p. 178, n. 5 (1819).

Common in Cachar in May and June. This species has a restricted range, being confined to Assam and Burma, and giving place in the Malay Peninsula to *E. limborgii*, *E. menetriesii*, and *E. pinwilli*.

8. EUPLŒA (*Trepsichrois*) LINNÆI.

Trepsichrois linnæi, Moore, Proc. Zool. Soc. Lond., 1883, p. 286, n. 1, pls. xxix, fig. 4, *female*; xxx, fig. 1, *male*; *Euplœa midamus*, Linnæus, *auctorum*.

Common in Cachar and on Nemotha. Mr. A. G. Butler (Ann. & Mag. Nat. Hist., 5th series, vol. xvi, p. 300, n. 9, 1885), records *Trepsichrois van-deventeri*, Forbes ("Wanderings of a Naturalist," p. 274, 1885, from Cachar (Assam), Malacca, and Sumatra) from "near Assam." We have examined large series of *E. linnæi* from many localities in the wide distributional area of that species, extending from the Kulu valley in the west to Sibsagar in the east of the Himalayan range, through Burma, to the Malay Peninsula, but we have not succeeded in detecting the presence of any differences of greater value than those which are exhibited by the individuals of every animal and vegetable species whatsoever. Even Mr. Moore, who described *E. linnæi*, failed to observe the specific differences that Mr. Forbes has detailed in describing his species, as he gives all the localities for *E. linnæi* that Mr. Forbes gives for *E. van-deventeri*. The description as a distinct species of a slight variety, if it is even that in this instance, of a well-known, common, and wide-spread species is, in our opinion, very much to be deprecated.

9. EUPLŒA (*Danisepa*) RHADAMANTHUS.

Papilio radamanthus, Fabricius, Ent. Syst., vol. iii, pt. i, p. 42, n. 127, *male* (1793).

Common in Cachar from April to August. It occurs to the eastwards as far as Nepal at any rate; it is replaced in Burma and to the southwards by the closely allied *E. diocletianus*. The female is much rarer than the male, three specimens only having been obtained; as a rule in this genus the sexes are of about equally common occurrence.

Mr. Wood-Mason notes that "the eversible caudal rosettes of the males are finely vanilla-scented."

10. EUPLŒA (*Pademma*) KLUGII.

E. klugii, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 130, n. 258 (1857); and in Anderson's Anat. and Zool. Researches, p. 922 (1878).

Five males 6th and 7th April, five females 5th to 7th April, four males 18th May to 10th June, four females 1st to 21st June, in the station of Silchar and the forests around.

The Indian Museum, Calcutta, also possesses specimens from Sylhet, and others obtained in Burma by the Yunan Expedition, the latter identified by Mr. Moore.

The blue shot in some of the Cachar specimens is very deep and brilliant, and extends in the forewing to the marginal series of dots, in others it is far less deep and vivid (in which cases it is more violet than blue) and less extensive, only reaching to rather less than midway between the end of the cell and the submarginal series of spots; in some specimens, indeed, it is hardly more developed than in examples of *E. kollari*, Felder, from Calcutta, and from them these latter can hardly be distinguished. In some specimens the marginal series of dots on the forewing is complete to the apex, in others it is obsolete towards the apex, and, in two specimens taken in Upper Burma by the Yunan Expedition, it is altogether absent. So with the submarginal series of spots: the full complement is eight, but in some examples this number is reduced to four on the apical half: the spots are also equally variable in shape and colour, some are small and round, others larger and oval, while others again are produced into elongated streaks: sometimes they are almost entirely violet, at others they are white-centred, and at others lastly they are almost entirely white. In some specimens there is no discal series of spots outside the cell, in others there are as many as five, the one in the second median interspace being sometimes obsolete.

In the hindwing, the same inconstancy obtains in the two series of spots on the margin: in some specimens both are as prominent and as complete as in South China specimens of *E. alopia*, Godart, between which condition of completeness and the defect of all but two or three apical spots of the inner series there is every gradation in both sexes. One of the female varieties has been described by Mr. Butler as *E. grantii*,* from Cachar, but, as the above remarks show, *E. klugii* is one of the most variable of butterflies, so much so that some specimens of it are almost if not quite indistinguishable from some specimens of *E. kollari*, while its extremes are so very distinct that the one is brilliantly shot with blue, and the other exhibits only a trace of this interference colour in certain lights. The underside is quite as variable as the upper, and, in a single Upper Burma female, there is a prominent violet-white spot in the discoidal cell of the forewing, visible above and below.

Following the principles of division adopted by Mr. Moore in his "Monograph of *Limnaina* and *Euplœina*,"† we could make almost as many species as there are specimens in it out of our large series captured in Cachar under circumstances that leave no room for doubt that we have to do with a number of individuals of a single variable species. We have, therefore, abandoned the attempt to split up our specimens into the several species discriminated by Mr. Moore in the *Pademma* group.

11. EUPLŒA (*Pademma*) ERICHSONII.

E. erichsonii, Felder, Reise Novara, Lep., vol. ii, p. 324, n. 444 (1865); *E. crassa*, Butler, Proc. Zool. Soc. Lond., 1866, p. 278, n. 31.

One female 6th April. This specimen has the submarginal spots on the upperside of the forewing reduced to five large ones at the apex, and the blue gloss confined to the dark base of the wings.

12. EUPLŒA (*Isamia*) ROGENHOFERI.

E. rogenhoferi, Felder, Reise Novara, Lep., vol. ii, p. 325, n. 446 (1865); *E. splendens*, Butler, Proc. Zool. Soc. Lond., 1866, p. 272, n. 9.

Three males and a female, from April to June.

13. EUPLŒA (*Stictoplœa*) BINOTATA.

Stictoplœa binotata, Butler, Journ. Linn. Soc., Zoology, vol. xiv, p. 302, n. 7 (1878).

Two pairs taken in May and June. Mr. Moore (Proc. Zool. Soc. Lond., 1883, pp. 319, 320) records two "new species" of this group from Cachar. From the descriptions they must be very close to *E. binotata*, which itself is probably inseparable from *E. hopei*, Felder.

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* Trans. Ent. Soc. Lond., 1879, p. 2.

† Proc. Zool. Soc. Lond., 1883, p. 201.

Subfamily SATYRINÆ.

14. ANADEBIS HIMACHALA.

Mycalesis ? himachala, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 234, n. 503 (1857).

Numerous specimens of both species, May, July, and August. This is a butterfly that occurs only in thick forests, very seldom venturing out into the sun, and even then never far from the shelter of large trees.

15. MYCALESIS (*Virapa*) ANAXIAS.

M. anaxias, Hewitson, Ex. Butt, vol. iii, *Mycalesis* pl. iv, figs. 25, 26, *male* (1862).

One male near Silcuri, 9th August, and another on Nemotha, 24th September.

16. MYCALESIS (*Orsotriæna*) MEDUS.

Papilio medus, Fabricius, Syst. Ent., p. 488, n. 198 (1775).

Numerous specimens of both sexes taken between 26th May and 9th August, that is to say, during the rainy season.

17. MYCALESIS (*Orsotriæna*) RUNEKA.

M. runeka, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 234, n. 501 (1857).

Four males only from 3rd to 5th April, that is to say, at the end of the dry season. It is almost certainly but a seasonal form of *M. medus.*

18. MYCALESIS (*Calysisme*) BLASIUS.

Papilio blasius, Fabricius, Ent. Syst., Suppl., p. 426, n. 488-9 (1798).

Eleven males and a female around Silcuri between 27th May and 28th June.

19. MYCALESIS (*Calysisme*) PERSEUS.

Papilio perseus, Fabricius, Syst. Ent., p. 488, n. 199 (1775).

Two males only near Silchar on 3rd April. This is almost certainly but a cold and dry season form of *M. blasius.*[*]

20. MYCALESIS (*Calysisme*) MINEUS.

Papilio mineus, Linnæus, Syst. Nat., ed. x, p. 471, n. 84 (1758).

Seventy-five males and seventeen females in Silcuri and the forests around between 26th May and 25th August. A single male of the cold and dry season form (*M. indistans* and *M. visala*, Moore) was obtained in Silchar on 3rd April. The latter form must swarm in its season just as we have above given evidence that the wet season generation does in its season.

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[*] Since the above was put in type Mr. de Nicéville has proved by breeding that *M. blasius* and *M. perseus* are but seasonal forms of one and the same species.

21. MYCALESIS (*Pachama*) SUAVEOLENS, Pl. XVI, Fig. 1, ♂.

M. suaveolens, W.-M. & de N., in Butt. of India, vol. i, p. 125, n. 103 (1883).

♂. Wings above and below dark sepia, fringed with ashy-white. UPPERSIDE. *Forewing* with the costal and outer margins regularly arched; with a narrow and very indistinct light brownish discal band extending, parallel to the outer margin, from the subcostal nervure to the first median nervule; with two velvety-black, white-pupilled ocelli encircled by a slender iris of ochreous-brown of almost the same shade as, but more distinctly expressed than, the discal band; with the first of these ocelli the smaller, triple (having a minute white-pupilled ocellule run together with it at either end), and so placed that its pupil lies in the fold between the discoidal nervules; with the second ocellus much the larger, circular, and placed in the middle of the first median interspace, whence it extends a short distance into the two adjoining interspaces; and with two obsolete anteciliary pale lines. *Hindwing* above with a single perfect and slightly elongated ocellus in the first median interspace, the bounding nervules of which it does not reach; with a minute rudimentary ocellus on the fold of the discoidal interspace on one side only; and with the anteciliary pale lines more distinct than in the forewing. UNDERSIDE darker and more richly coloured, but not striated; with a narrow cretaceous-white common discal band extending from the subcostal nervure in the forewing to the submedian nervure in the hindwing, where it runs into the inner of the two pale anteciliary lines, which, equally distinct in both wings, are somewhat coarser in the forewing; and with a third pale line following the outer configuration of the ocelli. *Forewing* ocellated as above. *Hindwing* with seven ocelli arranged in two decreasing series, the first of which consists of four slightly decreasing ocelli, and the second, of three more rapidly decreasing ones, of which the first corresponds to the one visible above, but is larger, so extending beyond the limits of its interspace on both sides as to touch the second, which is united to the third or anal. *Antennæ* above concolorous with the wings and body, below lighter and indistinctly annulated, becoming orange towards the black orange-tipped club. *Cilia* ashy-white throughout.

EXPANSE, ♂, 2·5 inches.

HAB.—Cachar and Sikkim.

A single specimen was taken on Nemotha (T. S.), N. Cachar, at an elevation of 3,300 feet, in September.

Mr. Wood-Mason notes: "The scent-glands and fans, which are much as in *M. malsara*, Moore, emitted a powerful and delicious odour resembling that of vanilla for some hours after the death of the insect."

Nearest allied to *Mycalesis mestra* (Hewitson, Ex. Butt., vol. iii, *Mycalesis* pl. i, figs. 2, 3, *female*, 1862, from Bhutan, Assam, and the Khasi Hills), from the figure of which it differs, above, in having three subapical conjugated ocelli and the discal band less distinct in the forewing, and only one subanal ocellus in the hindwing, instead of two, as in *M. mestra*; and, below, in having the ground unstriated throughout, one posterior ocellus instead of two in the forewing, and an additional ocellus in the middle of the ocellated band in the hindwing.

Mr. Otto Möller has taken a few specimens of this beautiful species in May in Sikkim at about 3,000 feet elevation.

The female is rather larger and paler than the male, but does not differ in markings.

22. MYCALESIS (*Kabanda*) MALSARIDA.

M. malsarida, Butler, Cat. Diurn. Lep. B. M., *Satyridæ*, p. 134, n. 27, pl. iii, fig. 14 (1868).

One male on Nemotha, 21st September. It agrees equally well with the description of *M. khasiana*, Moore (Proc. Zool. Soc. Lond., 1874, p. 566, from the Khasia Hills), the only other species in Mr. Moore's genus *Kabanda* (Trans. Ent. Soc. Lond., 1880, p. 168), except that the ocelli on the underside are not "minute." In the original description of *M. khasiana* no reference is made to *M. malsarida*, nor is it possible from the description alone of the former to tell in what, if any, other respects, besides the single character mentioned above, it differs from the latter.

23. NEORINA CRISHNA.

Cyllo crishna, Westwood, Gen. Diurn. Lep., vol. ii, p. 361, n. 9, *note*, ♂ (1851).

Seven males, Nemotha, 12th September to 4th October.

24. LETHE EUROPA.

Papilio europa, Fabricius, Syst. Ent., p. 500, n. 247 (1775).

Several specimens around Silchar in the forests, one female on Nemotha.

25. LETHE ROHRIA.

Papilio rohria, Fabricius, Mant. Ins., vol. ii, p. 45, n. 446 (1787).

A few specimens from forests in Silchar in August, two from Nemotha in September.

"The males of this species," Mr. Wood-Mason notes, "emit a delicious vanilla-like scent."

26. ORINOMA DAMARIS.

O. damaris, Gray, Lep. Ins. Nepal, p. 14, pl. vii, figs. 2, 2*a* (1846).

One male Nemotha, 4th October.

27. YPTHIMA PHILOMELA.

Papilio philomela, Johanssen, Amœn. Acad., vol. vi, p. 404, n. 60 (1764).

Abundant from April to September, obtained on Nemotha in October. The specimens shew great variation in the size of the ocelli on the underside, and there is often an additional seventh ocellus between, and sometimes confounded with, the two anterior pairs of ocelli on the hindwing. None of them, however, exhibit the markings of the cold and dry season form which Mr. Butler has described under the name of *Y. marshallii*.

28. YPTHIMA NEWARA.

Yphthima newara, Moore, Proc. Zool. Soc. Lond., 1874, p. 567.

Three males and one female in forests near Silcuri on May 18th, one male on July 28th. Mr. Butler (Ann. & Mag. of Nat. Hist., fifth series, vol. XVI, p. 302, n. 18, 1885) records from Manipur, *Y. narada*, Kollar, a species confined to the N.-W. Himalayas so far as we are aware.

29. YPTHIMA HUEBNERI.

Y. hübneri, Kirby, Syn. Cat. Diurn. Lep., p. 95, n. 18 (1871).

Some hundreds of specimens were taken exhibiting, as usual, great variation in the ocellated markings; amongst which were a few of the cold and dry season form, *Y. howra*, Moore.

30. ERITES FALCIPENNIS, Pl. XVI, Fig. 2, ♂.

E. falcipennis, W.-M. & de N., in Butt. of India, vol. i, p. 237, n. 230 (1883).

♂. Nearest allied to *E. angularis*, Moore,* but differs from that species in the UPPERSIDE being dark fuliginous throughout, in the *forewing* being distinctly falcate, and in the ocellus being round and prominently white-pupilled, with a very narrow pale iris. *Hindwing* with the discal fascia and series of blind ocelli hardly defined by ochreous, the outer margin less waved, especially at the third median nervule, where in *E. angularis* the wing is produced into a short tail, and the marginal lines obsolete. UNDERSIDE. All the markings duller and less ochreous. *Forewing* with a small circular central pure white pupil to the posterior ocellus, not a large, nacreous, and eccentric oval one, as in *E. angularis ;* and the iris narrow. On the *hindwing* the ocelli are small, the two discal fasciæ wider and deeper ochreous. The striæ on both wings are shorter and more crowded, forming on the *hindwing* a submarginal purplish band.

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* *Erites angularis*, Moore, Proc. Zool. Soc. Lond., 1878, p. 825, ♂, from Upper Tenasserim; and Distant, Rhop. Malay., p. 46, pl. v, fig. 3, ♂, from Perak.

EXPANSE : 2·1 to 2·3 inches.

One male in the forests near Silcuri on 6th August, and another male on Nemotha on 25th September.

31. MELANITIS LEDA.

Papilio leda, Linnæus, Syst. Nat., ed. x, p. 474, n. 102 (1758) ; *P. ismene*, Cramer, Pap. Ex., vol. i, pl. xxvi, figs. A, B (1775) ; *Melanitis determinata*, Butler, Ent. Month. Mag., vol. xxi, p. 246 (1885).

One male and two females Silchar, 3rd—5th April, and one male Silcuri, 27th May, of the cold and dry season form (true *M. ismene) ;* nine males and seven females, Silcuri and around, 27th May—9th July, and two males, Subong, 26th and 29th August, of the rains form (*M. leda, auctorum*).

Subfamily ELYMNIINÆ.

32. ELYMNIAS UNDULARIS.

Papilio undularis, Drury, Ill. Ex. Ins., vol. ii, pl. x, figs. 1, 2, *male* (1773).

Twenty-seven males and two females were captured in the forests around Silcuri between 14th April and 6th August, most common in June and July.

Mr. Wood-Mason notes that " the males emit a strong odour resembling vanilla, and the females are scentless."

33. ELYMNIAS LEUCOCYMA.

Biblis leucocyma, Godart, Enc. Méth., vol. ix, p. 326, n. 3 (1819).

Three males, Silcuri, 21st June—4th July.

34. DYCTIS PATNA.

Melanitis patna, Westwood, Gen. Diurn. Lep., vol. ii, p. 405, n. 6, *note*, pl. lxviii, fig. 2 (1851).

One male on Nemotha, 21st September.

Subfamily MORPHINÆ.

35. AMATHUSIA PORTHEUS.

A. portheus, Felder, Reise Novara, Lep., vol. iii, p. 461, n. 780 (1867).

Two males from the forests around Silcuri, 3rd and 5th August, and one female from Rupacherra in the Hylacandy subdivision, where it was obtained by Mr. Chalmers, by whom it was generously presented to Mr. Wood-Mason. One male forewing was also picked up near Silcuri.

36. DISCOPHORA TULLIA.

Papilio tullia, Cramer, Pap. Ex., vol. i, pl. lxxxi, figs. A, B, *female* (1775).

Thirty-one males and four females in the forests around Silcuri between 11th May and 25th August.

37. ENISPE EUTHYMIUS, Pl. XV, Fig. 1, ♂.

Adolias euthymius, Doubleday, Ann. and Mag. of Nat. Hist., vol. xvi, p. 179 (1845); *Enispe tessellata*, Moore, Proc. Zool. Soc. Lond., 1883, p. 521.

One male, 8th September, on Nemotha, agrees exactly with the description of *E. tessellata* from Nepal and Sikkim. The type specimen of *E. euthymius* was from the Himalaya Mountains, to which locality Sylhet and Assam were added in the 'Genera.' *E. euthymius* is, judging from the specimens in the Indian Museum, Calcutta, an eminently variable species, whose variations are in no way related either to locality or to geographical range, so that even the term 'local race' cannot be applied to the extreme dark form named *E. tessellata* by Mr. Moore, and here figured.

38. THAUMANTIS DIORES.

T. diores, Doubleday, Ann. and Mag. of Nat. Hist., vol. xvi, p. 234 (1845).

Two males, 6th September, and one female, 2nd October, on Nemotha.

Mr. Wood-Mason notes that "the scent-fans of the male are vanilla-scented."

39. STICHOPHTHALMA CAMADEVA.

Thaumantis camadeva, Westwood, Cab. Or. Ent., p. 9, pl. iv (1848).

Very common in the month of May in the forests near Silcuri (Irangmara), forty males and three females having been taken between the 7th and 20th, on which latter date, as enough females had already been obtained for examination in the fresh state and for the zoological collection, the collector Motiram was told to catch no more specimens. Two more males were, however, subsequently brought in on 6th and 21st July.

"The gland," Mr. Wood-Mason notes, "covered by a patch of modified scales and by an erectile whisp of hairs on each hindwing in the male, secretes a fluid that gives out a pleasant odour distinct from, but so faint as barely to be perceptible in the presence of, a much stronger odour (resembling that of sable fresh from the furrier's shop) which is common to the two sexes."

Subfamily NYMPHALINÆ.

40. ERGOLIS MERIONE.

Papilio merione, Cramer, Pap. Ex., vol. ii, pl. cxliv, figs. G, H (1777).

Numerous specimens of both sexes obtained in the station of Silchar and at, and in the neighbourhood of, Silcuri between 3rd April and 3rd August.

41. ERGOLIS ARIADNE.

Papilio ariadne, Linnæus, Syst. Nat., ed. xii, vol. i, pt. 2, p. 778, n. 170 (1767).

Twenty-four males and nine females at, and in the neighbourhood of, Silcuri and at Doloo between 9th June and 26th August.

42. EURIPUS HALITHERSES.

E. halitherses, Doubleday and Hewitson, Gen. Diurn. Lep., vol. ii, p. 293, n. 1, pl. xli, fig. 2, *male* (1850).

Five males at Doloo, Silcuri, and neighbouring forests, and in Hasooria from 20th May to 25th August.

43. ATELLA SINHA.

Terinos sinha, Kollar, Hügel's Kaschmir, vol. iv, pt. 2, p. 438, n. 1 (1848).

A male and a female in Silcuri, 18th May, two males on Nemotha, 8th and 10th September.

44. ATELLA PHALANTA.

Papilio phalanta, Drury, Ill. Ex. Ins., vol. i, pl. xxi, figs. 1, 2 (1770).

One male in the forest near Silcuri on 28th July.

45. CETHOSIA CYANE.

Papilio cyane, Drury, Ill. Ex. Ins., vol. i, pl. iv, fig. 1, *female* (1770).

Fifty-nine males and twenty-four females in the forests near Silcuri between 3rd May and 5th August.

46. CETHOSIA BIBLIS.

Papilio biblis, Drury, Ill. Ex. Ins., vol. i, pl. iv, fig. 2, *male* (1770).

Three males and three females in forests near Silcuri, 12th May to 28th July, a male and a female on Nemotha, 21st September and 4th October.

47. CYNTHIA EROTA.

Papilio erota, Fabricius, Ent. Syst., vol. iii, pt. 1, p. 76, n. 237 (1793).

Twelve males and a female in forests near Silcuri between 10th June and 8th August, two males on Nemotha, 8th and 28th September.

48. PRECIS IPHITA.

Papilio iphita, Cramer, Pap. Ex., vol. iii, pl. ccix, figs. C, D (1779).

Twenty-nine males and three females in and around Silcuri, 3rd April to 30th July.

49. JUNONIA ASTERIE.

Papilio asterie, Linnæus, Syst. Nat., ed. x, p. 472, n. 90 (1758).

Twenty-two males and three females in the forests around Silcuri, and in the station of Silchar, between 9th June and 26th August.

50. JUNONIA ALMANA.

Papilio almana, Linnæus, Syst. Nat., ed. x, p. 472, n. 89 (1758).

A single male in the forests near Silchar on 3rd April. There is not the smallest doubt that this and the preceding species are seasonal forms of one species; the dates of capture in this instance show this most clearly. We have kept them separate, however, as the fact that they are one species cannot be said to be proved till the one form has been bred from eggs laid by the other.

51. JUNONIA ATLITES.

Papilio atlites, Linnæus, Cent. Ins., p. 24, n. 72 (1763).

Ten males and two females in Silcuri and around, 20th May to 20th July.

52. JUNONIA LEMONIAS.

Papilio lemonias, Linnæus, Syst. Nat., ed. x, p. 473, n. 93 (1758).

Common in Silcuri and neighbourhood.

53. JUNONIA HIERTA.

Papilio hierta, Fabricius, Ent. Syst., Suppl., p. 424, n. 281-2 (1798).

One pair, forest near Silchar on 9th June.

54. JUNONIA ORITHYIA.

Papilio orithya, Linnæus, Syst. Nat., ed. x, p. 473, n. 94 (1758).

A single male in the forests near Silchar on 29th July.

55. NEPTIS HORDONIA.

Papilio hordonia, Stoll in Suppl. Cramer, Pap. Ex., vol. v, pl. xxxiii, figs. 4, 4 D (1790).

Thirteen males and four females in forest near Silcuri between 19th May and 8th August.

56. NEPTIS KUHASA.

N. kuhasa, de Nicéville, Journ. A. S. B., vol. lv, pt. 2, p. 250, n. 2, pl. xi, fig. 12, *male* (1886).

♂. UPPERSIDE. *Both-wings* black with orange markings. *Forewing* with a broad discoidal streak bounded behind by the median nervure, obscurely separated from the large triangular spot beyond by two fine black lines; a broad subapical patch well-separated from a rather less broad discal one, which reaches the inner margin, and is strongly constricted at the first median nervule; a prominent submarginal somewhat lunate band, with a very obscure and fine pale marginal line. *Hindwing* with a broad straight even discal band, and a similar but narrower (about one-third the width) submarginal band; marginal line as in the forewing. UNDERSIDE. *Both wings* with the ground-colour much paler, and the bands also paler, ochreous rather than orange. *Forewing* marked as above. *Hindwing* with an additional ochreous band at the base of the costal margin, the discal and submarginal bands broader with the band of the ground-colour between them hence narrower, the outer margin broadly fuscous, bearing a prominent ochreous line. FEMALE, *both wings* slightly paler. *Forewing* with the apex less produced. UPPERSIDE. *Hindwing* with the discal band narrower, the submarginal band wider than in the male. UNDERSIDE with the same differences as the upper.

EXPANSE: ♂, 1·9; ♀, 2·0 inches.

Differs from Upper Tenasserim specimens of *N. sattanga*, in both sexes, in the submarginal band of the upperside being narrower, the band of the ground-colour between the discal and submarginal ochreous bands on the underside twice as wide, and the outer margin broadly fuscous, bearing a prominent ochreous line, in the hindwing. In *N. sattanga*, the margin is equally broadly ochreous inwardly bounded by a narrow black line, the extreme margin being defined by a very fine black line.

One male on 29th July, and two females on 8th August at Irangmara.

57. NEPTIS RADHA.

N. radha, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 166, n. 343, pl. iva, fig. 4 (1857).

One male, Nemotha, 8th September.

58. NEPTIS HARITA.

N. harita, Moore, Proc. Zool. Soc. Lond., 1874, p. 571, pl. lxvi, fig. 8.

Three males taken in forests around Silcuri between 13th July and 2nd August. It is decidedly a rare species. Mr. Distant considers *N. harita* to be a variety of *N. vikasi* (Rhop. Malay., p. 444, n. 5*a*, pl. xliii, fig. 8, 1886), and so it may be, but, as it is readily distinguishable, so far as the specimens before us are concerned, we have thought it best to keep it separate from that species.

59. NEPTIS VARMONA.

N. varmona, Moore, Proc. Zool. Soc. Lond., 1872, p. 561.

Eighteen males and seven females in forests around Silchar between 3rd April and 14th July, and two males, Dooloo, on 25th August. It is probable that some of the specimens included under this name are really nearer to the next species, for it is by no means easy to draw the line between the two.

60. NEPTIS KAMARUPA.

N. kamarupa, Moore, Proc. Zool. Soc. Lond., 1874, p. 570.

Four males, Silchar, from 3rd to 7th April. There is but little doubt that *N. kamarupa* is the cold and dry season form of *N. varmona*, and that many other seasonal forms of the latter widespread, common, and variable species have been described as distinct.

61. NEPTIS SOMA.

N. soma, Moore, Proc. Zool. Soc. Lond., 1858, p. 9, n. 17, pl. xlix, fig. 6.

One male on 11th, and one female on 20th July, in forests near Silcuri.

62. NEPTIS SUSRUTA.

N. susruta, Moore, Proc. Zool. Soc. Lond., 1872, p. 563, pl. xxxii, fig. 4.

Five males between 6th April and 28th July, and six females between 3rd April and 4th July, in forests around Silchar.

63. NEPTIS OPHIANA.

N. ophiana, Moore, Proc. Zool. Soc. Lond., 1872, p. 561.

One male taken near Silchar on 7th April.

64. NEPTIS JUMBAH.

N. jumbah, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 167, n. 345, pl. iv*a*, fig. 5 (1857).

Two males, Silcuri, on 20th June and 2nd July.

65. CIRRHOCHROA AORIS.

Cirrochroa aoris, Doubleday and Hewitson, Gen. Diurn. Lep., vol. i, p. 158, n. 1, pl. xxi, fig. 2, *male* (1848).

One male on Nemotha on 12th September.

66. CIRRHOCHROA MITHILA.

Cirrochroa mithila, Moore, Proc. Zool. Soc. Lond., 1872, p. 558.

Twenty-seven males and nine females, Silcuri and neighbouring forests and Rupacherra, between 3rd May and 10th August, also two males on Nemotha, 12th September and 2nd October.

67. STIBOCHIONA NICEA.

Adolias nicea, Gray, Lep. Ins. Nepal, p. 13, pl. xii, fig. 1 (1846).

One female, Subong, 26th August.

68. HYPOLIMNAS BOLINA.

Papilio bolina, Linnæus, Syst. Nat., ed. x, p. 479, n. 124 (1758).

Numerous specimens of both sexes in the station of Silchar, in and around Silcuri, and at Lalla Mookh, between 5th April and 12th August.

69. PENTHEMA LISARDA.

Diadema lisarda, Doubleday, Ann. and Mag. of Nat. Hist., vol. xvi, p. 233 (1845).

Thirty-four males and one female in the forests near Silcuri from 11th July to 13th August, and one male at the foot of the North Cachar Hills on 29th August.

70. PARTHENOS GAMBRISIUS.

Papilio gambrisius, Fabricius, Mant. Ins., vol. ii, p. 12, n. 113 (1787).

Nineteen males and seventeen females at and around Silcuri between 3rd May and 8th August.

71. NEUROSIGMA SIVA.

Adolias siva, Westwood, Gen. Diurn. Lep., vol. ii, p. 291, n. 18 (1850).

Three richly-coloured males on Nemotha, 8th and 10th September.

72. LEBADEA ISMENE.

Limenitis ismene, Doubleday and Hewitson, Gen. Diurn. Lep., vol. ii, p. 276, n. 10, pl. xxxiv, fig. 2 (1850).

Two males on 6th and 21st July, and one female on 10th August, in forest near Silcuri.

73. LIMENITIS AUSTENIA.

Lebadea austenia, Moore, Proc. Zool. Soc. Lond., 1872, p. 560, pl. xxxii, fig. 1.

A pair taken on Nemotha on 12th September.

74. LIMENITIS DARAXA.

L. daraxa, Doubleday and Hewitson, Gen. Diurn. Lep., vol. ii, p. 276, n. 11, pl. xxxiv, fig. 4 (1850).

One male near Silcuri on 28th June, another on Nemotha on 12th September.

75. LIMENITIS (*Moduza*) PROCRIS.

Papilio procris, Cramer, Pap. Ex., vol. ii, pl. cvi, figs. E, F (1777).

Nine males and one female at and around Silcuri between 9th May and 8th August, and a female on Nemotha on 21st September.

76. ATHYMA PERIUS.

Papilio perius, Linnæus, Syst. Nat., ed. x, p. 471, n. 79 (1758); *A. leucothoë*, Linnæus, *auctorum*.

Twenty-four males and eleven females at Dooloo, Subong, Silcuri and around, and the station of Silchar, between 5th April and 1st September.

77. ATHYMA ASURA.

A. asura, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 171, n. 350, pl. v*a*, fig. 1 (1857).

Three males at Irangmara between 18th and 30th July.

78. ATHYMA PRAVARA.

A. pravara, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 173, n. 354, pl. v*a*, fig. 4 (1857).

Two males at Irangmara on 18th July.

79. ATHYMA SELENOPHORA.

Limenitis selenophora, Kollar, Hügel's Kaschmir, vol. iv, pt. 2, p. 426, n. 1, pl. vii, figs. 1, 2, *male* (1848); *Athyma bahula*, Moore, Proc. Zool. Soc. Lond., 1858, p. 12, n. 3, pl. l, fig. 2, *female*.

Three males from forest near Silcuri, 21st to 25th July. There is not the smallest doubt that the *A. bahula* of Moore is the female of this species. The female of the allied *A. zeroca*, Moore (a male of which from Sikkim is here figured on Pl. XVI, Fig. 6), differs from its male in exactly the same way as does that of *A. selenophora* from its male.

80. ATHYMA INARINA.

A. inarina, Butler, Ann. and Mag. of Nat. Hist., fifth series, vol. xvi, p. 304, n. 37 (1885); *A. inara*, Doubleday and Hewitson, *auctorum*.

Six males and four females at Dooloo and in forest near Silcuri between 9th June and 25th August.

81. SYMPHÆDRA DIRTEA.

Papilio dirtea, Fabricius, Ent. Syst., vol. iii, pt. 1, p. 59, n. 184 (1793).

Nineteen males between 6th July and 13th August, four females, 23rd July to 6th August, in forests around Silcuri; also six males and one female on Nemotha between 10th and 4th October.

82. SYMPHÆDRA CYANIPARDUS.

S. cyanipardus, Butler, Proc. Zool. Soc. Lond., 1868, p. 613, n. 4.

Two males in forests around Silcuri on 5th and 8th August.

83. EUTHALIA LEPIDEA.

Adolias lepidea, Butler, Ann. and Mag. of Nat. Hist., fourth series, vol. i, p. 71 (1868).

Very numerous specimens in the forests around Silcuri between 14th April and 13th August.

84. EUTHALIA TELCHINIA.

Adolias telchinia, Ménétriés, Cat. Mus. Pet., Lep., vol. ii, p. 120, n. 1262, pl. ix, fig. 3, *male* (1857); *A. aphidas*, Hewitson, Ex. Butt., vol. iii, *Adolias* pl. ii, fig. 8, *female* (1862).

One male on Nemotha, 28th September.

85. EUTHALIA APPIADES.

Adolias appiades, Ménétriés, Cat. Mus. Pet., Lep., vol. ii, p. 120, n. 1263, pl. ix, fig. 4, *male* (1857); *A. sedeva*, Moore, Trans. Ent. Soc. Lond., new series, vol. v, p. 68, n. 10, pl. iv, fig. 3, *female* (1859).

As in Sikkim at low elevations, so in Cachar, this is one of the very commonest butterflies, and was met with between 3rd May and 13th August in the forests around Silcuri, both sexes being nearly equally prevalent. The form which Mr. Moore describes and figures as *sedeva* is the one which occurs in Cachar.

86. EUTHALIA JAHNU, Pl. XVI, Fig. 5, ♀.

Adolias jahnu, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 192, n. 387, *female* (1857); *A. sananda*, Moore, Trans. Ent. Soc. Lond., new series, vol. v, p. 76, n. 30, pl. vii, fig. 3, *male* (1859).

Two males, Irangmara, 2nd and 3rd, one female, Irangmara, 13th August, and another, Durgakuna, 28th April. The female of this species* not having been figured from a typical specimen by Mr. Moore, is refigured here.

87. EUTHALIA KESAVA.

Adolias kesava, Moore, Trans. Ent. Soc. Lond., new series, vol. v, p. 67, n. 9, pl. iii, fig. 5, *male* and *female* (1859); *Euthalia phemius*, Staudinger, Ex. Schmett., pl. liv, ♀ only (1885).

Two males and two females between 18th July and 10th August in forests around Silcuri.

88. EUTHALIA GARUDA.

Adolias garuda, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 186, n. 374, pl. vi, figs. 2, *larva*; 2a, *pupa* (1857).

Sixty-two males and twenty females in forests around Silcuri between 29th May and 12th August.

89. EUTHALIA PHEMIUS.

Itanus phemius, Doubleday and Hewitson, Gen. Diurn. Lep., vol. ii, pl. xli, fig. 4, *male* (1850); *Adolias sancara*, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 195, n. 394, *female* (1857); *Euthalia phemius*, Staudinger, Ex. Schmett., pl. liv, ♂ only (1885).

One female, Irangmara, 8th August. Mr. Moore continues to consider *E. phemius* and *E. sancara* as distinct species, though every one we have met who knows these insects in the field unhesitatingly places the two together under the former name as the opposite sexes of one. He admits, however, that the specimens he had described as the opposite sexes of his species were both of the female sex. The two were united as the opposite sexes of one species on structural grounds alone in 1881 by Mr. Wood-Mason, whose conclusion was subsequently confirmed by the field observations of Mr. de Nicéville and others.

90. EUTHALIA JAMA, Pl. XVI, Figs. 4, ♂; 3, ♀.

Adolias jama, Felder, Reise Novara, Lep., vol. iii, p. 431, n. 690 (1867).

A single female was obtained on Nemotha on 12th September, and is here figured. At the same time we have figured a male specimen from the Naga Hills in the collection of the Indian Museum, Calcutta.

It has nothing whatever to do with either sex of the *Euthalia* described and figured by Mr. Distant under the same name (Rhop. Malay., p. 119, n. 4, pls. xiv, fig. 8, ♂; xv, fig. 4, ♀ (1883).

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* *A. jahnu*, Moore, Trans. Ent. Soc. Lond., new series, vol. v, p. 74, n. 24, pl. vii, fig. 1, *female* (1859).

91. EUTHALIA LUBENTINA.

Papilio lubentina, Cramer, Pap. Ex., vol. ii, pl. clv, figs. C, D, *female* (1777).

One male, Silcuri, 27th June.

92. EUTHALIA ANOSIA.

Adolias anosia, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 187, n. 376 (1857).

One female at Irangmara on 12th July, another seen, *alis extensis*, on the wall of a room in the bungalow at Lalla Mookh in June, presenting the appearance of a leaf overgrown by a fungus, and one male on Nemotha on 12th September.

93. PYRAMEIS CARDUI.

Papilio cardui, Linnæus, Syst. Nat., ed. x, p. 475, n. 107 (1758).

A single male in forest near Silcuri on 19th July.

94. SYMBRENTHIA HIPPOCLUS.

Papilio hippoclus, Cramer, Pap. Ex., vol. iii, pl. ccxx, figs. C, D, *male* (1779).

One male, Dooloo, 25th August.

95. SYMBRENTHIA HYPSELIS.

Vanessa hypselis, Godart, Enc. Méth., vol. ix, Suppl., p. 818 (1823).

One male on Nemotha, 28th September.

96. RHINOPALPA FULVA.

R. fulva, Felder, Wien. Ent. Monatsch., vol. iv, p. 399, n. 21 (1860).

Nine males in forests near Silcuri from 5th May to 10th August. The inner edge of the black band on the outer margin of the forewing on the upperside is straight in the Cachar specimens; in *R. polynice*, Cramer, it is well-curved. The two species are very doubtfully distinct.

97. DOLESCHALLIA POLIBETE.

Papilio polibete, Cramer, Pap. Ex., vol. iii, pl. ccxxxiv, figs. D, E (1779).

Two males and one female near Silcuri, 7th to 22nd June. Seen on the wing frequently at Rupacherra.

98. CHARAXES (*Eulepis*) DELPHIS.

C. delphis, Doubleday, Ann. Soc. Ent. France, second series, vol. i, p. 217, pl. vii (1843).

One male near Silcuri on 9th August.

99. CHARAXES (*Eulepis*) ATHAMAS.

Papilio athamas, Drury, Ill. Ex. Ins., vol. i, p. 5, pl. ii, fig. 4 (1770).

Four males, obtained in forests around Silcuri between 10th June and 13th August.

100. CHARAXES (*Eulepis*) ARJA.

C. arja, Felder, Reise Novara, Lep., vol. iii, p. 438, n. 713 (1867).

One male, Irangmara, 8th August. Four male specimens of what appears to be a variety of *C. arja* were obtained, from 28th to 31st June and on 3rd August, in the forests around Silcuri. They differ from the typical form in always having a single small subapical spot only in the forewing, the discal band narrow (·25 of an inch in width at the inner margin of the forewing), the ground-colour very deep indigo-blue on the upperside, and all the markings richer and darker on the underside.

101. CHARAXES FABIUS.

Papilio fabius, Fabricius, Sp. Ins., vol. ii, p. 12, n. 47 (1781).

Seen in September in Silchar, where it was obtained on a previous occasion by one of the Museum collectors.

102. CHARAXES (*Haridra*) MARMAX.

C. marmax, Westwood, Cab. Or. Ent., p. 43, pl. xxi, *male* and *female* (1848).

Five males in forests in and around Silcuri between 6th June and 29th July.

103. CHARAXES (*Haridra*) LUNAWARA.

C. lunawara, Butler, Lep. Ex., p. 99, n. 6, pl. xxxvii, fig. 2, *male* and *female* (1872).

Two males, 6th and 13th July.

104. CHARAXES (*Haridra*) CORAX.

C. corax, Felder, Reise Novara, Lep., vol. iii, p. 444, n. 724 (1867).

Numerous males obtained between 10th June and 10th August, only two of which agree exactly with the description of this species, the rest being transitional to *C. hierax*, Felder.

105. CHARAXES (*Haridra*) JALINDER.

C. jalinder, Butler, Lep. Ex., p. 98, n. 4, pl. xxxvii, fig. 4, *male* and *female* (1872).

One male, Dhurmkhal, 31st June, and one on Nemotha, 10th September, agree fairly well with Butler's description and figure of this species, though differing *inter se*.

106. CHARAXES (*Haridra*) HINDIA.

C. hindia, Butler, Lep. Ex., p. 99, n. 5, pl. xxxvii, fig. 5, *male* and *female* (1872).

Nine males between 14th June and 20th August in forest around Silcuri. They differ considerably from one another, no two being exactly alike; nor does any one of them agree minutely with Mr. Butler's figure of this species.

Family **Lemoniidæ**.

Subfamily NEMEOBIINÆ.

107. ZEMEROS PHLEGYAS.

Papilio flegyas, Cramer, Pap. Ex., vol. iii, pl. cclxxx, figs. E, F (1780).

Fifteen specimens of both sexes obtained in the forests around Silcuri between 20th May and 8th August.

Family **Lycænidæ**.

108. PATHALIA ? MALAYA.

Lycæna malaya, Horsfield, Cat. Lep. E. I. Co., p. 70, n. 4 (1828).

One male, Irangmara, 18th July. This specimen possesses tails, going therefore into Mr. Moore's genus *Pathalia*; and it is entirely black on the upperside. A complete gradation can be made from this black form to one with the white area on the upperside of both wings more extensive than the black ground-colour, which latter form has been described by Mr. Moore as *P. albidisca*. In Mr. Moore's genus *Megisba*, which has no tails, the same variation occurs: *M. thwaitesi* from Ceylon has a small patch of white on the upperside of the forewing only, *M. sikkima* is entirely black, but there are other specimens from Sikkim which have the white area above of greater extent than the black. The type of *M. sikkima* is in the Indian Museum, Calcutta, and has tails; so perhaps Mr. Moore does not consider the presence or absence of the tails to be of generic consequence. He has also named for the Indian Museum, Calcutta, some Andaman specimens of this group with tails "*Megisba thwaitesi*," still further showing that he considers the tails of no importance. In this we quite agree with him, but would carry the matter still further and treat *Pathalia malaya*, *P. albidisca*, *Megisba thwaitesi*, and *M. sikkima* as one variable tailed or tailless species.

109. CURETIS ? SARONIS.

C. saronis, Moore, Proc. Zool. Soc. Lond., 1877, p. 587.

Ten males, 9th June to 13th August, and three females, 30th May to 17th July, in forests around Silcuri. In both sexes, they agree more closely with the Andaman species *C. saronis* than with any other described species known to us.

110. CYANIRIS PUSPA.

Polyommatus puspa, Horsfield, Cat. Lep. E. I. Co., p. 67, n. 3 (1828).

One female, Silcuri, 31st June, one male, Dhurmkhal, 19th July, and one male, Nemotha, 2nd October.

111. CHILADES VARUNANA.

Polyommatus varunana, Moore, Proc. Zool. Soc. Lond., 1865, p. 772, pl. xli, fig. 6.

Three males and two females in and around Silcuri from 25th May to 4th June. *C. laius*, Cramer, is almost certainly the cold and dry season form of this species.

112. ZIZERA SANGRA.

Polyommatus sangra, Moore, Proc. Zool. Soc. Lond., 1865, p. 772, pl. xli, fig. 8.

Two males and four females at Dooloo on 25th August. We are quite unable to say how *Z. indica*, Murray, differs from this species.

113. ZIZERA DILUTA.

Lycæna diluta, Felder, Reise Novara, Lep., vol. ii, p. 280, n. 353, pl. xxxv, figs. 12, 13, *male* (1865).

Common in and around Silcuri from 28th May to 23rd June.

114. ? TARUCUS PLINIUS.

Hesperia plinius, Fabricius, Ent. Syst., vol. iii, pt. 1, p. 284, n. 92 (1793).

One male, Silcuri, 25th June.

115. CASTALIUS ELNA.

Lycæna elna, Hewitson, Ex. Butt., vol. v, *Lycæna* pl. i, fig. 8 (1876).

Three males, Irangmara, 18th to 28th July.

116. CASTALIUS ROSIMON.

Papilio rosimon, Fabricius, Syst. Ent., p. 523, n. 341 (1775).

Numerous specimens of both sexes in forests in and around Silcuri, 3rd April to 12th August.

117. JAMIDES BOCHUS.

Papilio bochus, Cramer, Pap. Ex., vol. iv, pl. cccxci, figs. C, D, *male* (1782).

Many males and females in Silcuri from 27th May to 4th July.

118. LYCÆNESTHES LYCÆNINA.

L. lycænina, Felder, Verh. zool.-bot. Gesellsch. Wien, vol. xviii, p. 281 (1868).

Two males, Silcuri, 13th and 30th June, one male, Irangmara, 5th August, three females, Silcuri, 28th May to 22nd June.

119. LYCÆNESTHES BENGALENSIS.

L. bengalensis, Moore, Proc. Zool. Soc. Lond., 1865, p. 773, pl. xli, fig. 9, *male.*

Numerous males in Silcuri and neighbourhood, 25th May to 30th July.

120. NACADUBA ARDATES.

Lycæna ardates, Moore, Proc. Zool. Soc. Lond., 1874, p. 574, pl. lxvii, fig. 1, *male.*

Many examples of both sexes from Silcuri and around between 26th May and 28th July.

121. NACADUBA ? ATRATA.

Lycæna atratus, Horsfield, Cat. Lep. E. I. Co., p. 78, n. 13 (1828).

A single pair, Silcuri, 7th June, agree with Horsfield's description of this species from Java, and have been so named by Mr. Moore, to whom the specimens were sent for identification. To this group of the genus belong *N. prominens*, Moore, and *N. plumbeomicans* and its local form *nicobarica*, Wood-Mason and de Nicéville. They all possess *three* catenulated bands on the underside of the forewing.

122. NACADUBA CŒLESTIS, de Nicéville, Pl. XVII, Fig. 11, ♂.

"♂. UPPERSIDE, *both wings* shining bluish-purple, the outer margins somewhat widely black. *Hindwing* with a fine white anteciliary line from the anal angle to the first median nervule. UNDERSIDE, *both wings* dusky. *Forewing* with a subbasal straight fascia from the subcostal nervure to the inner margin darker than the ground-colour, and margined with white; a similar fascia from near the costa to the inner margin enclosing the disco-cellular nervules, and a series of five similar spots forming an outwardly curved band from the costa to the second median nervule; a submarginal series of dusky spots outwardly narrowly and inwardly widely defined with white; an anteciliary fine white line. *Hindwing* with three indistinct basal spots, a subbasal straight band, another across the disc, coalescing with a shorter much curved one beyond, and enclosing a conspicuous small oblong white spot, marginal markings as in forewing, but with a round black spot beyond the origin of the 'tail,' outwardly defined with silvery-blue scales and inwardly with an orange line, and with a few similar scales towards the anal angle. *Cilia* dusky, as is also the 'tail,' the latter tipped with white."

"EXPANSE, 1·1 inch."

One male, Silcuri, 28th May, another, Irangmara, 21st July. This very pretty and distinct species occurs also at Jhulaghát, 2,000 feet, in Kumaon (*W. Doherty*), the Khasi Hills (*H. J. Elwes*), Sibsagar (*S. E. Peal*), and one specimen, the type, was obtained by the late Mr. A. R. de Roepstorff at Port Blair in the Andamans. The figure is taken from a rather pale specimen; the bands on the underside being usually much more prominently filled in with dark brown.

123. NACADUBA MACROPHTHALMA, Pl. XVII, Fig. 13, ♂.

Lycæna macrophthalma, Felder, Verh. zool.-bot. Gesellsch. Wien, vol. xii, p. 483, n. 115 (1862).

Two males, Silcuri, 29th May and 7th June.

124. NACADUBA ? PAVANA.

Lycæna pavana, Horsfield, Cat. Lep. Mus. E. I. Co., p. 77, n. 12 (1828).

Six males, Silcuri and neighbouring forests, 10th June to 8th August, and two females, 30th May and 25th July, agree with Horsfield's description of this species from Java.

125. NACADUBA VIOLA, Pl. XVII, Fig. 12, ♂.

Lampides viola, Moore, Ann. and Mag. of Nat. Hist., fourth series, vol. xx, p. 340 (1877).

A single male, Irangmara, 8th July, has been thus identified by Mr. Moore.

126. CATOCHRYSOPS STRABO.

Hesperia strabo, Fabricius, Ent. Syst., vol. iii, pt. 1, p. 287, n. 101 (1793).

A few specimens of both sexes in and around Silcuri from 6th April to 26th August.

127. POLYOMMATUS BŒTICUS.

Papilio bœticus, Linnæus, Syst. Nat., ed. xii, vol. i, pt. 2, p. 789, n. 226 (1767).

One female, Silcuri, 3rd June, one male, Nemotha, 2nd October.

128. LAMPIDES ELPIS.

Polyommatus elpis, Godart, Enc. Méth., vol. ix, p. 654, n. 125 (1823).

One female, Silcuri, 29th May, another Sildubi, 20th July, two more, Nemotha, 6th September and 2nd October.

129. CATAPŒCILMA ELEGANS, Pl. XV, Fig. 6, ♂.

Hypochrysops elegans, Druce, Proc. Zool. Soc. Lond., 1873, p. 350, n. 1, pl. xxxii, fig. 12.

Three males and one female at Silcuri between 27th May and 9th June.

130. ILERDA EPICLES.

Polyommatus epicles, Godart, Enc. Méth., vol. ix, p. 646, n. 109 (1823).

Eight specimens in the forests around Silcuri between 21st April and 29th August.

131. IRAOTA TIMOLEON.

Papilio timoleon, Stoll in Suppl. Cramer, Pap. Ex., pl. xxxii, figs. 4, 4 D, *female* (1790).

One female, Silcuri, 25th May.

132. CHLIARIA OTHONA.

Hypolycæna othona, Hewitson, Ill. Diurn. Lep., p. 50, n. 7, pl. xxii, figs. 17, 18, *male* (1865); *H. eltola*, idem, id., Suppl., p. 14, n. 21, pl. v, figs. 37, 38, *female* (1869).

One male, Irangmara, 8th August.

133. HYPOLYCÆNA ERYLUS.

Polyommatus erylus, Godart, Enc. Méth., vol. ix, p. 633, n. 60 (1823).

Ten males at Silcuri and Irangmara, 31st May to 20th August.

134. REMELANA JANGALA.

Amblypodia jangala, Horsfield, Cat. Lep. E. I. Co., p. 113, n. 44 (1828).

One male, Silcuri, 20th June.

135. DEUDORIX EPIJARBAS.

Dipsas epijarbas, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 32, n. 40 (1857).

One male, Silcuri, 2nd June, one female, Silcuri, 25th May, and another, Irangmara, 8th August.

136. DEUDORIX DIENECES.

D. dieneces, Hewitson, Ill. Diurn. Lep., Suppl., p. 31, n. 35, pl. va, figs. 65, 67. *male*; 66, *female* (1878).

One male, Silcuri, 21st June.

137. VADEBRA PETOSIRIS.

Deudorix petosiris, Hewitson, Ill. Diurn. Lep., p. 22, n. 13, pl. ix, figs. 30, 31, *male* (1863).

One male, Silcuri, 15th June.

138. LEHERA SKINNERI, n. sp., Pl. XV, Fig. 3, ♀.

♀. UPPERSIDE differs only from the same sex of *L. eryx*, Linnæus, in the anal lobe of the *hindwing* being centred with clear ochreous instead of emerald-green. UNDERSIDE differs only from that species in having the ground-colour clear ochreous also instead of emerald-green.

EXPANSE: 1·8 inches.

One female, Irangmara, 21st July.

139. RAPALA SCHISTACEA.

Deudorix schistacea, Moore, Proc. Zool. Soc. Lond., 1879, n. 140.

Seven males and four females, Silcuri between 27th May and 23rd June.

140. SPINDASIS HIMALAYANUS.

Aphnæus himalayanus, Moore, Journ. A. S. B., vol. liii, pt. 2, p. 26 (1884).

Sixty-six specimens obtained in Silcuri and the neighbouring forests between 27th May and 6th August,—most common in June.

141. SPINDASIS SYAMA.

Amblypodia syama, Horsfield, Cat. Lep. E. I. Co., p. 107, n. 39 (1828).

Four males and two females in Silcuri and around from 1st to 15th June, one female, Subong, 29th August.

142. TAJURIA LONGINUS.

Hesperia longinus, Fabricius, Ent. Syst., Suppl., p. 430 (1798).

One male, Silcuri, 13th June.

143. CHERITRA ETOLUS.

Papilio etolus, Fabricius, Mant. Ins., vol. ii, p. 66, n. 620 (1787).

Five males at Irangmara and Durgakuna between 3rd May and 25th July.

144. CHERITRA ACTE.

Myrina acte, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 47, n. 77 (1857).

One female, Irangmara, 21st July.

145. LOXURA ATYMNUS.

Papilio atymnus, Cramer, Pap. Ex., vol. iv, pl. cccxxxi, figs. D, E (1780).

Thirty-five examples in and around Silcuri between 7th May and 12th August.

146. LOXURA TRIPUNCTATA.

L. tripunctata, Hewitson, Ill. Diurn. Lep., p. 26, n. 4 (1863).

Three males and one female in Silcuri and surrounding forests 31st May, and 11th to 19th July.

147. SURENDRA QUERCETORUM.

Amblypodia quercetorum, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 42, n. 63, pl. ia, fig. 7, *male* (1857).

Five males and seven females in forests in and around Silcuri from 29th May to 12th August.

148. NILASERA CENTAURUS.

Papilio centaurus, Fabricius, Syst. Ent., p. 520, n. 329 (1775).

One male, Irangmara, 11th July.

149. NILASERA CAMDEO.

Amblypodia camdeo, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 41, n. 58, pl. ia, fig. 6, *female* (1857).

Twenty-five specimens of both sexes between 5th April and 10th August in Silcuri and surrounding forests.

150. SATADRA BAZALUS.

Amblypodia bazalus, Hewitson, Cat. *Lycænidæ* B. M., p. 8, n. 38, pl. iv, figs. 37, 38, *female* (1862).

One female, Silcuri, 31st May, another, Dhurmkhal, 14th July.

Family **Papilionidæ.**

Subfamily PIERINÆ.

151. TERIAS HARINA.

T. harina, Horsfield, Cat. Lep. E. I. Co., p. 137, n. 63 (1829).

One male, Dhurmkhal, 21st May, and another, Irangmara, 8th August.

152. TERIAS HECABE.

Papilio hecabe, Linnæus, Syst. Nat., ed. x, p. 470, n. 74 (1758).

Nine males and ten females in and around Silcuri from 25th May to 25th August. Under this name are doubtless included many so-called distinct species of this group.

153. CATOPSILIA CATILLA.

Papilio catilla, Cramer, Pap. Ex., vol. iii, pl. ccxxix, figs. D, E, *female* (1779).

Six males and eight females in Silcuri and surrounding forests from 30th May to 10th August.

154. CATOPSILIA CROCALE.

Papilio crocale, Cramer, Pap. Ex., vol. i, pl. lv, figs. C, D, *female* (1775).

Numerous examples of both sexes in forests in and around Silcuri from May to July, but most common in the former of these two months.

155. CATOPSILIA GNOMA.

Papilio gnoma, Fabricius, Syst. Ent., App., p. 828, n. 152-3 (1775).

Four males, Silchar, 5th to 7th April, one female, 5th April, three females, Silcuri, 7th April to 12th June.

Mr. Wood-Mason noted that the tufts of hair on the wings of the male "smell like jessamine."

156. CATOPSILIA PYRANTHE.

Papilio pyranthe, Linnæus, Syst. Nat., ed. x, p. 469, n. 66 (1758).

Four males and four females, Silcuri, 25th May to 16th June.

157. IXIAS, sp.

Three males, Irangmara, 11th and 13th July. These specimens agree in the size, in the width of the black border on the upperside of the hindwing, and on the underside with the figure of *I. evippe*, Drury (Ill. Ex. Ins., vol. i, pl. v, fig. 2, *male*, 1770), but differ in the orange patch on the upperside of the forewing being much smaller.

158. HEBOMOIA GLAUCIPPE.

Papilio glaucippe, Linnæus, Syst. Nat., ed. x, p. 469, n. 65 (1758).

Four males and three females in and around Silcuri from 7th April to 22nd July.

159. CATOPHAGA PAULINA.

Papilio paulina, Cramer, Pap. Ex., vol. ii, pl. cx, figs. E, F, *female* (1777).

Seven males in forests in and around Silcuri from 20th May to 11th July, another male on Nemotha, 2nd October; twelve females, first form, from 30th May to 11th July, three females, second form (apex of forewing and entire hindwing on underside rich ochreous), 13th June to 4th July, around Silcuri.

160. APPIAS NERO.

Papilio nero, Fabricius, Ent. Syst., vol. iii, pt. 1, p. 153, n. 471 (1793).

A single female of this very rare species at Irangmara on 29th July. Mr. Otto Möller has also obtained a single female in Sikkim.

161. APPIAS HIPPOIDES.

A. hippoides, Moore, Trans. Ent. Soc. Lond., 1881, p. 312.

Very numerous specimens of both sexes in forests in and around Silcuri from 6th April to 29th August, also on Nemotha, 10th September.

162. APPIAS ZELMIRA.

Papilio zelmira, Cramer, Pap. Ex., vol. iv, pl. cccxx, figs. C, D, *female* (1780).

Nearly as common as the preceding in similar localities from 25th May to 22nd July.

163. HIPOSCRITIA INDRA.

Pieris indra, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 74, n. 143 (1857).

One female, Nemotha, 25th September. This sex is very rare in collections, while the male, having quite different habits, is very common.

164. HUPHINA NAMA.

Pieris nama, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 76, n. 148 (1857).

One male, Silcuri, 13th June, and a female on 1st June.

165. HUPHINA PHRYNE.

Papilio phryne, Fabricius, Syst. Ent., p. 473, n. 131 (1775).

One male, Silcuri, 8th July.

166. MANCIPIUM CANIDIA.

Papilio canidia, Sparrman, Amœn. Acad., vol. vii, p. 504, note *m* (1768).

Five males and one female from 7th April to 9th June in and around Silcuri.

167. MANCIPIUM AJAKA.

Pieris ajaka, Moore, Proc. Zool. Soc. Lond., 1865, p. 490, n. 21, pl. xxxi, fig. 16, *female*.

One male, 10th September, on Nemotha.

168. DELIAS PASITHOË.

Papilio pasithoe, Linnæus, Syst. Nat., ed. xii, vol. i, pt. 2, p. 755, n. 53 (1767).

Eighteen males and eleven females in forests around Silcuri from 22nd May to 10th August.

169. DELIAS DESCOMBESI.

Pieris descombesi, Boisduval, Sp. Gén., vol. i, p. 465, n. 38 (1836).

Six males and four females, Silcuri and around, 6th April to 8th August.

170. DELIAS HIERTE, var. INDICA.

Thyca hierte, var. *indica*, Wallace, Trans. Ent. Soc. Lond., third series, vol. p. 351, n. 21 (1867).

Twenty-two males and ten females in forests around Silcuri, 29th May to 5th August.

Mr. Wood-Mason notes that "both sexes have a strong grateful musk odour."

Subfamily **Papilioninæ.**

171. ORNITHOPTERA POMPEUS.

Papilio pompeus, Cramer, Pap. Ex., vol. i, pl. xxv, fig. A, *female* (1775).

One male, Irangmara, 6th August, one female, Sildubi, 2nd July; another female, Irangmara, 28th July.

172. ORNITHOPTERA RHADAMANTHUS.

O. rhadamanthus, Boisduval, Sp. Gén., vol. i, p. 180, n. 8 (1836).

Two females, Nemotha, 12th and 13th September.

173. PAPILIO (*Iliades*) ANDROGEUS.

P. androgeos, Cramer, Pap. Ex., vol. i, pl. xci, figs. A, B, *male* (1776).

Forty-two males; six females, first form (figured by Distant as the female of *P. mestor*, Hübner), one female, second form (the *P. agenor* of Cramer), eight females, third form (the *P. alcanor* and *P. achates* of Cramer); in forests and gardens in and around Silcuri, Irangmara, the Doarband pass, Hasooria, and Rupacherra; where it was almost always to be seen from 3rd April to 10th August. On one occasion, all four forms were seen on the wing together in a group, having evidently just emerged from the chrysalis state, and a specimen of each was taken.

Mr. Wood-Mason notes that "all the forms of this species are inodorous."

174. PAPILIO (*Panosmiopsis*, subg. nov.) RHETENOR.

P. rhetenor, Westwood, Arc. Ent., vol. i, p. 59, pl. xvi, figs. 1, 1*a*, *male* (1842); *P. icarius*, id., Cab. Or. Ent., p. 5, pl. ii, *female* (1848).—Wood-Mason, Ann. and Mag. of Nat. Hist., fifth series, vol. ix, pp. 104-5 (1882).

Two females only, Nemotha, 28th September, flying in company with *P. dasarada*, many specimens of which were taken, but only two preserved, the rest having been used for dissection and experiment or been in too bad a state to be worth preservation.

Mr. Wood-Mason notes that they are "scentless."

175. PAPILIO (*Pangeranopsis*, subg. nov.) ELEPHENOR.

P. elephenor, Doubleday, Ann. and Mag. of Nat. Hist., vol. xvi, p. 305 (1845).

One male, Dhurmkhal, 5th July, of this rare species, which also occurs at Jorehât, Assam (*J. L. Sherwill*).

176. PAPILIO (*Panosmia*, subg. nov.) DASARADA.

P. dasarada, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 96, n. 195 (1857).—Wood-Mason, Ann. and Mag. of Nat. Hist., fifth series, vol. ix, p. 105 (1882).

Two females, on Nemotha, 21st September and 4th October.

Mr. Wood-Mason notes that they had "the strong scent of caged porcupines with a touch of musk."

177. PAPILIO (*Panosmia*) NEVILLI, Pl. XV, Figs. 2, 2 *a*, ♂.

P. nevilli, Wood-Mason, Ann. and Mag. of Nat. Hist., fifth series, vol. ix, p. 105, n. 2 (1882); *Papilio*, n. s. ?, Nevill, List Diurn. Lep. Indian Museum, Calcutta, p. 1, n. 7 (1870).

"♂. Posterior wings above with two large pink-white spots, one between the discoidal vein and the second branch of the subcostal, occupying all but the two ends of the space; the other in the space next in front, smaller and not extending so far towards the base of the space, and with three bright crimson submarginal lunules, two subequal in the interspaces between the branches of the median vein, and the third between the third median veinlet and the discoidal vein, equal to, or slightly greater than, the other two taken together; below with a small pink-white spot between the first branch of the subcostal and the costal veins, forming with the two visible on both sides of the organs a series of three, all equally distant from the outer margin, the submarginal lunules larger and subequal and much lighter coloured, and with a fourth rather irregularly-shaped crimson spot, subequal to the lunules and divided into two unequal parts by the first median vein, at the end of the basal half of which it is placed, with the tails well developed, but not constricted at base."

"HAB. The vicinity of Silchar, Cachar. The three specimens before me were obtained many years ago by one of the native collectors of the museum, under the late Mr. N. T. Davey, of the Topographical Survey of India."

"Nearly allied to *P. ravana*, Moore, from Kulu, in the north-west Himalayas, but smaller, with the well-developed tails not constricted at the base, and not red-spotted." (*Wood-Mason*, l. c.).

178. PAPILIO (*Pangerana*) ERIOLEUCA.

P. erioleuca, Oberthür, E'tudes d'Ent., vol. iv, p. 33, n. 5, pl. iii, fig. 1, *male* (1879); id., de Nicéville, Journ. A. S. B., vol. lii, pt. 2, p. 98, n. 256, *female* (1883).

One male, Irangmara, 8th August, one female, Nemotha, 10th September.

179. PAPILIO (*Pangerana*) ASTORION.

P. astorion, Westwood, Ann. and Mag. of Nat. Hist., vol. ix, p. 37 (1842).

Four males and five females, Irangmara, 11th May to 10th August.

Mr. Wood-Mason notes that "the female emits a strong and disgustingly rank musky odour."

180. PAPILIO (*Charus*) CASTOR.

P. castor, Westwood, Ann. and Mag. of Nat. Hist., vol. ix, p. 37 (1842).

Seventeen males, Irangmara, 11th July to 8th August.

181. PAPILIO (*Charus*) HELENUS.

P. helenus, Linnæus, Syst. Nat., ed. x, p. 459, n. 4 (1758).

Fourteen males and three females, 7th May to 20th August, in the forests around Silcuri.

182. PAPILIO (*Charus*) CHAON.

P. chaon, Westwood, Arc. Ent., vol. ii, p. 97, pl. lxxii, figs. 1, 1*, *male*(1845).

Three males, Irangmara, 25th July to 6th August.

183. PAPILIO (*Zetides*) AGAMEMNON.

P. agamemnon, Linnæus, Syst. Nat., ed. x, p. 462, n. 21 (1758).

Ten males and three females in forests around Silcuri from 12th May to 5th August.

184. PAPILIO (*Zetides*) EURYPYLUS.

P. eurypylus, Linnæus, Syst. Nat., ed. x, p. 464, n. 37 (1758).

Eleven males and one female in forests around Silcuri from 6th May to 8th August. The Cachar specimens are a little larger than the typical figure of this species (Clerk's Icones Ins., vol. ii, pl. xxviii, fig. 2, 1764), and have the discal bluish-green macular band even wider. They agree with *P. mecisteus*, Distant, in the colour and markings of the underside; differing therefrom in being considerably larger, and in having the basal linear spot in the cell continued almost to the inner margin, and the discal band broader, on the upperside of the forewing. They do not agree with the species Mr. Moore has vaguely described from N. E. Bengal under the name of *Zetides acheron* (Ann. and Mag. of Nat. Hist., fifth series, vol. xvi, p. 120 (1885).

185. PAPILIO (*Dalchina*) SARPEDON.

P. sarpedon, Linnæus, Syst. Nat., ed. x, p. 461, n. 14 (1758).

Eight males and two females in Silcuri and surrounding forests from 28th April to 6th August.

186. PAPILIO (*Paranticopsis*, subg. nov.) MACAREUS.

P. macareus, Godart, Enc. Méth., vol. ix, p. 76, n. 144 (1819).

One male, Rupacherra, presented by Mr. Chalmers.

187. PAPILIO (*Paranticopsis*) XENOCLES.

P. xenocles, Doubleday, Gray's Zool. Misc., p. 74 (1842).

One male, Durgakuna, 6th May.

188. PAPILIO (*Pathysa*) ANTIPHATES.

P. antiphates, Cramer, Pap. Ex., vol. i, pl. lxxii, figs. A, B (1775).

Nine males and one female, Silcuri and around, 19th May to 29th July.

189. PAPILIO (*Laertias*) POLYTES.

P. polytes, Linnæus, Syst. Nat., ed. x, p. 460, n. 7 (1758).

Thirty-eight males (*P. pammon*, Linnæus), three females, first form like the male, fourteen females, second form (the *P. polytes* of Linnæus), and one female, third form (the *P. romulus* of Cramer), in forests in and around Silchar from 3rd April to 12th August.

190. PAPILIO (*Menelaides*) ARISTOLOCHIÆ.

P. aristolochiæ, Fabricius, Syst. Ent., p. 443, n. 3 (1775).

Twenty males and four females in and around Silcuri from 11th May to 13th August.

Mr. Wood-Mason notes that "the male emits a strong and slightly pungent odour resembling that of ? Batchelor's Buttons or of the rose with a trace of acetic acid."

191. PAPILIO (*Menelaides*) DOUBLEDAYI.

P. doubledayi, Wallace, Trans. Linn. Soc., vol. xxv, p. 42, *note* (1865); id., Butler, Trans. Ent. Soc. Lond., 1879, p. 2.

Five males, Silcuri, Irangmara, and Doarband, 8th May to 28th July. Our specimens agree except in size (being as large as Butler's smallest specimen of *P. doubledayi*) with the *P. cacharensis* of Butler, which is described from "near Assam," the country given by Wallace as one of the habitats of his species. Our series of specimens from Burma (Maulmein), the other habitat given by Wallace for his species, present great variation in the size of the white spots in the hindwing, the chief character on which Mr. Butler appears to have relied in separating his species.

Mr. Wood-Mason notes that this species has a "musk-scented body."

192. PAPILIO (*Orpheides*) ERITHONIUS.

P. erithonius, Cramer, Pap. Ex., vol. iii, pl. ccxxxii, figs. A, B (1779).

Five males and one female, Silcuri and neighbourhood, 3rd April to 12th August.

193. PAPILIO (*Harimala*) PARIS.

P. paris, Linnæus, Syst. Nat., ed. x, p. 459, n. 3 (1758); id., Nevill, List Diurn. Lep. Indian Museum, Calcutta, p. 1, n. 17 (1870).

Two small males obtained many years back by one of the museum collectors.

194. LEPTOCIRCUS CURIUS.

Papilio curius, Fabricius, Mant. Ins., vol. ii, p. 9, n. 71 (1787).

Eighteen males in the Irangmara and Silcuri forests from 23rd May to 10th August.

Family **Hesperiidæ.**

195. BADAMIA EXCLAMATIONIS.

Papilio exclamationis, Fabricius, Syst. Ent., p. 530, n. 373 (1775).

Ten specimens, Silcuri and Dooloo, from 25th May to 25th August.

196. ISMENE ŒDIPODEA.

I. œdipodea, Swainson, Zool. Ills., vol. i, pl. xvi, *male*, *female*, *larva* and *pupa* (1820—1821).

Two males and two females, Irangmara and Silcuri, 20th May and 8th and 18th July.

197. ISMENE JAINA.

I. jaina, Moore, Proc. Zool. Soc. Lond., 1865, p. 782.

Two males, Nemotha, 12th September and 4th October.

198. ISMENE MAHINTHA.

I. mahintha, Moore, Proc. Zool. Soc. Lond., 1874, p. 575, pl. lxvii, fig. 4, *male*.

One female, Silcuri, 7th June. Hitherto known from Burmah only.

199. CHOASPES BENJAMINII.

Thymele benjaminii, Guérin, Delessert's Souv. Voy. dans l'Inde, vol. ii, p. 79, pl. xxii, figs. 2, 2*a* (1843).

One male, Irangmara, 10th August.

200. HASORA BADRA.

Goniloba badra, Moore, Proc. Zool. Soc. Lond., 1865, p. 778.

Ten males and eight females in forests around Silcuri, 30th May to 27th August.

201. HASORA COULTERI, n. sp., Pl. XVIII, Figs. 8, ♂; 8 *a*, 8 *b*, ♀.

♂. UPPERSIDE, *both wings* dark bronzy brown, paler at the base owing to the presence of a thick clothing of paler olivaceous-brown setæ; costal margin of the forewing and the veins and outer margins of both wings darker and faintly glossed with purple; and with the *cilia* smoky brown. *Forewing* without spots, but with three ill-defined discal bands composed of modified scales arranged along each side of the submedian nervure and of the first and second median nervules, and probably concealed by setæ in the living insect. UNDERSIDE, *forewing* strongly glossed with purple at the apex, and with a brownish ashy lustrous patch, extending nearly to the outer margin, divided by the submedian nervure, and slightly diffused over the disc. *Hindwing* crossed by a pearly-white slightly outwardly concave prominent discal band, which extends from the costal to the submedian nervure, where it is slightly recurved, is broadest in the middle of its length, narrowest at its posterior or inner extremity, and reappears close to the abdominal margin as a clump of white scales divided by the internal nervure; the wing suffused with purple beyond the white band, especially on the dark anal blotch, in front of which there extends nearly as far as the third median nervule a distinct whity-brown anteciliary line.

♀. UPPERSIDE, *both wings* darker and more richly coloured than in the male, being very conspicuously glossed with purple beyond the lighter basal portions. *Forewing* with three golden-yellow semi-transparent lustrous spots, two discal, situated and shaped much as in *Parata chromus*, Cramer, and one minute and subapical one at the junction of the first and second thirds of the length of the last subcostal cell, sometimes with two spots one above the other, the upper the smaller, and placed in the interspace next above. UNDERSIDE, *forewing* marked as above, with the inner margin ashy-white, and with a patch of ashy scales in the interno-median area at the level of the discal spots. *Hindwing* with the band broader than in the male and extending to the costal margin. In one of the specimens of this sex the upperside has a mottled appearance owing to the purple gloss being imperfectly developed, as in so many *Euplœas*. *Head* and *thorax* covered with iridescent olive-green pubescence nearly concolorous with that of the wings; abdominal segments of the *body* above and below edged posteriorly with yellowish inclining to orange above; *eyes* encircled with whity-brown scales; *palpi* clothed with mixed brown and yellowish scales.

EXPANSE: 2·1 inches.

Four males and two females, Silcuri and neighbouring forests, June 1st to July 25th.

202. BIBASIS SENA.

Goniloba sena, Moore, Proc. Zool. Soc. Lond., 1865, p. 778.

Six examples in and around Silcuri, from 16th June to 5th August.

203. BARACUS SEPTENTRIONUM, n. sp., Pl. XVIII, Figs. 4, 4*a*, ♂.

♂. UPPERSIDE, *both wings* very dark vandyke-brown with golden, and in certain lights, greenish reflections. *Forewing* with an oblique subcostal streak, another shorter one below this in the cell, two subapical small spots separated from one another by the penultimate subcostal branch, and an indistinct spot on the disc between the second and third median nervules, opaque ochreous-brown. UNDERSIDE, *forewing* greenish-black, increasingly bordered in front from the base to the apical angle and thence decreasingly to the inner angle with ochreous-brown, varied by light streaks on the folds and by the two subapical spots of the upperside. *Hindwing* throughout ochreous-brown similarly varied with lighter streaks. *Cilia* smoky-brown in the forewing, paler on the hindwing.

EXPANSE, 1·5 inches.

One male, Irangmara, 8th July, another very old specimen, also from Cachar, in the collection of the Indian Museum, Calcutta, and a third taken in the Sikkim Tarai by Mr. Otto Möller on 14th September, 1881.

B. septentrionum is nearly allied to *B. subditus*, Moore (Proc. Zool. Soc. Lond., 1883, p. 534), but it differs therefrom in its considerably larger size, in the spots on the upperside of the forewing being of a brighter ochreous, in the shade of the ochreous of the underside generally, and in lacking the conspicuously broad very pale yellow discal streak which extends from the base to near the outer margin of the hindwing and forms so marked a feature both in *B. subditus* from the Nilgiri and Pulni Hills and in *B. vittatus* (Felder) from Ceylon.

204. ASTICTOPTERUS SUBFASCIATUS, Pl. XVIII, Figs. 1, 1*a*, ♂.

A. subfasciatus, Moore, Proc. Zool. Soc. Lond., 1878, p. 842.

A male and a female from forest near Silcuri, 6th June and 20th July. The male of this species has a curious impressed elongated oval brand on the forewing, placed so immediately behind as to touch the median nervure, and extending for one-third of its length along the first median nervule. This species probably has no real connection with the genus *Astictopterus*.

205. ASTICTOPTERUS BUTLERI.

♂. Closely allied to *A. xanites*, Butler, from the Malay Peninsula, Java, and Borneo. UPPERSIDE, *both wings* dark fuliginous-brown, strongly suffused with purple and glossed with dark bronzy-brown according to the play of light. *Forewing* entirely lacking the broad orange band so conspicuous in *A. xanites*. UNDERSIDE, *forewing* paler and less strongly suffused with purple, paling from the middle of the interno-median area to the posterior margin. *Hindwing* plum-coloured, with the anterior margin fringed at the base with black bristles forming a tuft, which is lodged in, and nipped by the lips of, an elongated sac-like fold in the cell of the forewing.

♀. Larger than the male. UPPERSIDE, *forewing* with an obsolete oblique discal red band, which is sometimes quite absent, but distinct traces of which are always to be seen on the UNDERSIDE, which is rather lighter everywhere and less strongly suffused with purple than in the male. The *hindwing* of course lacks the tuft of black bristles present in the opposite sex.

EXPANSE: ♂, 1·5; ♀, 1·7 inches.

Three males and four females in forest near Silcuri, 8th to 19th July.

A preliminary notice and figure of this species appeared in Journ. A. S. B., vol. lii, pt. 2, p. 98, n. 260, pl. x, fig. 3, ♂ (1883). It is by no means an uncommon species at low elevations in Sikkim and Bhutan, and it has also been obtained in the Mergui Archipelago.

206. ASTICTOPTERUS OLIVASCENS, Pl. XVIII, Figs. 2, 2*a*, ♀.

A. olivascens, Moore, Proc. Zool. Soc. Lond., 1878, p. 692.

Three males and two females from forest near Silcuri, 11th to 29th July.

207. ASTICTOPTERUS SALSALA.

Nisoniades salsala, Moore, Proc. Zool. Soc. Lond., 1865, p. 786.

Thirty-five examples of both sexes in forests in and around Silcuri from 25th May to 6th August.

208. KERANA DIOCLES.

Nisoniades diocles, Moore, Proc. Zool. Soc. Lond., 1865, p. 787.

Thirteen males and two females in Silcuri and surrounding forests, 20th June to 12th August.

209. MATAPA ARIA.

Ismene aria, Moore, Proc. Zool. Soc. Lond., 1865, p. 784.

Twenty-four males and females, 25th May to 8th August, in and around Silcuri.

210. GANGARA THYRSIS.

Papilio thyrsis, Fabricius, Syst. Ent., p. 532, n. 383 (1775).

Two males and one female, Silcuri and around, 1st and 23rd June and 12th August.

211. BAORIS OCEIA.

Hesperia oceia, Hewitson, Desc. *Hesp.*, p. 31, n. 22 (1868).

Twenty-eight examples of both sexes in forests around Silcuri, 25th May to 22nd June. Messrs. Moore and Distant have both described species under the name of *Baoris unicolor*: Mr. Moore's species is considered by us to be conspecific with the *B. oceia* of Hewitson; Mr. Distant's species not possessing the tuft of hairs on the hindwing in the male, and hence probably belonging to another genus from our point of view.

212. PARNARA NAROOA.

Hesperia narooa, Moore, Proc. Zool. Soc. Lond., 1878, p. 687, pl. xlv, fig. 4.

Seven males and four females in and around Silcuri, 26th May to 21st June.

213. PARNARA AUSTENI.

Baoris austeni, Moore, Proc. Zool. Soc. Lond., 1883, p. 533.

Eight males and two females, Silcuri and around, 1st June to 8th August, one of which has been identified by Mr. Moore.

214. PARNARA ORNATA, Pl. XVIII, Figs. 7, 7*a*, ♂.

Hesperia ornata, Felder, Reise Novara, Lep., vol. iii, p. 515, n. 900, pl. lxxii, fig. 6 (1867).

One male, Doarband, 23rd May, appears to agree with Felder's figure and description of this species from Java.

215. PARNARA ASSAMENSIS.

Pl. XVIII, Figs. 5, 5*a*, ♂; Pl. XVII, Figs. 7, 7*a*, ♀.

♂, ♀. UPPERSIDE, *both wings* rich dark vandyke-brown prominently marked with semi-transparent white lustrous spots, with the base of the interno-median and the basal three-fourths of the inner margin of the forewing, and the posterior or inner half of the hindwing from the base nearly to the outer margin along the veins, clothed with olive-brown setæ. *Forewing* with ten spots in the male and eleven in the female, *viz.*,—two oblong at the end of the cell, disjunct in the male, but connected at their inner and opposite ends in the female, three subapical, and five discal in the male, but six in the female, forming an oblique series extending from the submedian nervure to the hinder discoidal nervule in the male, but to the subcostal (or front discoidal) in the female; of which spots the first is subtriangular, touches the submedian nervure, and is subequal to the fourth; the second, in the same interspace with the first, is equal to the first subapical, and lies close to, but does not touch, the first median nervule; the third, the largest of all, is equal to, or rather larger than, the first and fourth put together, and acute-angled at its outer end; the fourth is rhomboidal; the fifth rather larger than the second; and the sixth, present in the female only, is shaped somewhat like one of the strokes of a section-sign (§). *Hindwing* with a small oval discal spot sometimes accompanied by a very minute dot in front of the third median nervule. UNDERSIDE, *forewing* marked as above, but with the hindermost spot touching the submedian nervure outwardly diffused. *Hindwing* covered with minute olive-brown scales, and lighter internal to a straight line drawn obliquely across the interno-median area from the apex of the third median nervule to the base of the submedian nervure, with a prominent white lustrous dot near the anterior end of the cell and a curved discal series of four white lustrous spots, of which the third from the inner margin is by far the largest, transparent, visible on the upperside, and may or may not be accompanied by a minute dot, which may or may not be transparent and visible from above. *Body* clothed above with olive-green scales and setæ, lighter below. *Palpi* mixed luteous and olive-green. *Antennæ* black, broadly half-ringed below before the club with white, with their taper tips ashy.

EXPANSE: ♂, 2·2; ♀, 2·3 to 2·4 inches.

One male in forest near Silcuri on 11th July, from which the figure is taken. It occurs also in Sibsagar (*S. E. Peal*), at Shillong, and in Sikkim, where it is quite a common species at low elevations; the figure of the female has been taken from a Shillong specimen. A preliminary description of this species appeared in the Journ. A. S. B., vol. li, pt. 2, p. 65, n. 202 (1882). *P. assamensis* is the largest species of the genus known to us.

216. PARNARA BADA.

Hesperia bada, Moore, Proc. Zool. Soc. Lond., 1878, p. 688.

Seven males and eleven females in and around Silcuri from 25th May to 5th August.

217. PARNARA COLACA.

Hesperia colaca, Moore, Proc. Zool. Soc. Lond., 1877, p. 594, pl. lviii, fig. 7.

Many examples of both sexes in and around Silcuri from 30th May to 13th June, which agree with specimens from the Andamans of this somewhat variable species.

218. PARNARA TOONA.

Hesperia toona, Moore, Proc. Zool. Soc. Lond., 1878, p. 689.

One hundred and twenty specimens at and around Silcuri from 25th May to 12th August.

♀ (Hitherto undescribed). Rather larger and less richly-coloured than the male, with the large discal semi-transparent lustrous spot in the first median interspace of the forewing shorter, emarginate, and not extending to the base of the interspace. One example has only the three posterior of the spots of the underside of the hindwing—and those much reduced in size—instead of five, but four are visible on the upperside.

219. PARNARA ELTOLA, Pl. XVIII, Figs. 6, 6*a*, ♂.

Hesperia eltola, Hewitson, Ex. Butt., vol. iv, *Hesperia* pl. iv, fig. 40 (1869).

One male, Nemotha, 25th September.

220. CHAPRA SUBOCHRACEA.

Pamphila subochracea, Moore, Proc. Zool. Soc. Lond., 1878, p. 691.

One female, Silcuri, 8th June.

221. CHAPRA AGNA.

Hesperia agna, Moore, Proc. Zool. Soc. Lond., 1865, p. 791.

Five males and three females in and around Silcuri, 28th May to 25th June.

222. CHAPRA MATHIAS.

Hesperia mathias, Fabricius, Ent. Syst., Suppl., p. 433, n. 289-90 (1798).

One male and three females in and around Silcuri, 28th May to 9th June. The specific distinctness of this and the two preceding species is in our opinion extremely doubtful.

223. TELICOTA BAMBUSÆ.

Pamphila bambusæ, Moore, Proc. Zool. Soc. Lond., 1878, p. 691, pl. xlv, figs. 11, *male*; 12, *female*.

Over one hundred examples of both sexes taken throughout the season.

224. TELICOTA AUGIAS, Pl. XVII, Fig. 1, ♂.

Papilio augias, Linnæus, Syst. Nat., ed. xii, vol. i, pt. 2, p. 794, n. 257 (1767).

One male, Silcuri, 30st June, two females, Silcuri, 3rd and 21st June. This species may be known from the preceding much commoner one by the golden colouration of the upperside of the forewing extending along the veins to the outer margin, and being throughout paler.

225. PADRAONA PALMARUM.

Pamphila palmarum, Moore, Proc. Zool. Soc. Lond., 1878, p. 690, pl. xlv, figs. 6, *male*; 7, *female*.

Five males and four females in Silcuri and surrounding forests, 28th April to 22nd June.

226. PADRAONA GOLA.

Pamphila gola, Moore, Proc. Zool. Soc. Lond., 1877, p. 594, pl. lviii, fig. 9, *male.*

Thirty-seven examples of both sexes in and around Silcuri between 25th May and 5th August.

227. PADRAONA ? DARA.

Hesperia dara, Kollar, in Hügel's Kaschmir, vol. iv, pt. 2, p. 455, n. 4 (1848).

Five males and four females, Silcuri from 25th May to 3rd June.

228. PADRAONA, sp.

Three females, 29th and 31st May and 1st June at Silcuri. One of these specimens was sent for identification to Mr. Moore, who returned it labelled "? *P. mæsa*," a species already (P. Z. S. 1882, p. 262) sunk by himself as a synonym of *P. dara*. Our specimens differ from the same sex of the latter species, as identified by us, in having all the markings considerably larger, clearer, and of a paler shade of golden, differing in these respects also from Mr. Moore's figure of his *P. mæsa* (P. Z. S. 1865, p. 509, n. 118, pl. xxx, fig. 9).

229. AMPITTIA MARO.

Hesperia maro, Fabricius, Ent. Syst., Suppl., p. 432, n. 242-3 (1798).

Seven males, Silcuri and around from 15th June to 10th August.

230. TARACTROCERA MÆVIUS, Pl. XVII, Fig. 2, ♀.

Hesperia mævius, Fabricius, Ent. Syst., vol. iii, pt. 1, p. 352, n. 338 (1793).

Thirteen examples of both sexes, Silcuri, 29th May to 17th June. It is not known by us how *T. sagara*, Moore (Proc. Zool. Soc. Lond., 1865, p. 792) differs from this species. No mention of *T. mævius* is made by Mr. Moore in describing *T. sagara*.

231. HALPE SIKKIMA, Pl. XVII, Fig. 8, ♂.

H. sikkima, Moore, Proc. Zool. Soc. Lond., 1882, p. 407.

Three males, Irangmara and Dhurmkhal, 9th and 10th August.

232. ISOTEINON MICROSTICTUM, n. sp., Pl. XVII, Figs. 3, ♂ ; 3a, ♀.

♂. UPPERSIDE, *both wings* dark vandyke-brown, suffused with purple, especially on the costal and outer margins and the veins; the *cilia* ochreous-grey. *Forewing* with five small semi-transparent white lustrous spots, two (the first of which is very minute) before the apex, and three discal, one geminated in the cell consisting of an anterior outwardly-convex thin crescentic and a posterior triangular portion, another about the same size behind and a little external to this between the first and second median nervules subcrescentic in shape with its convexity turned towards the base, and a third squarish external to and in front of and rather less than half the size of, this again between the second and third median nervules. UNDERSIDE, *forewing* lighter than above, the translucent spots as on the upperside; with an indistinct submarginal band of spots darker than the ground; a dark anteciliary line; the *cilia* obsoletely intersected at the veins with dark; and an indistinct whity-brown spot touching the first median nervule and the satiny patch extending from the base nearly to the outer angle and from the interno-median fold to the inner margin of the wing, which bears a conspicuous fringe of slate-grey setæ in part projecting straight backwards and outwards from the edge and in part turned up so as to lie spread out fan-wise over the satiny-ashy patch. *Hindwing* darker and more suffused with purple than the forewing, with a dark anteciliary line, but even less distinctly intersected *cilia*; with some dark mottling indistinctly arranged in three bands, one subbasal and two closer together discal or submarginal, and with an indistinct dot between the costal and subcostal nervures, another near the end of the cell, on one side only in one specimen and on both sides in the other, a third between the second and third median nervules in one specimen, and a fourth between the first and second in the other, all ochreous-white.

♀. UPPERSIDE, *both wings* much lighter than in the male. *Forewing* with the spots much larger and more numerous, there being an additional subapical one, a very minute dot just in front of the third median nervule, both semi-transparent, and a third opaque yellow one (present in one male) touching the submedian nervure in front, and the third discal spot being quadrate with the inner and outer ends roundly emarginate. UNDERSIDE, *both wings* with the dark markings more distinct than in the male. *Forewing* devoid of the ashy patch and fringe of setæ seen in the opposite sex. *Hindwing* with two dots behind the costal nervure instead of one, one in the cell, and another between the second and third median nervules on one side only so minute as to be scarcely discernible.

EXPANSE: ♂, 1·4; ♀, 1·5 inches.

Allied to *I. flavipennis*, de Nicéville (Journ. A. S. B., vol. liv, pt. 2, p. 122, pl. ii, fig. 4, ♀ (1885), but differs in markings, and notably in the colour of the ground of the underside, which is pale vandyke-brown in *I. microstictum* and ferruginous-ochreous in *I. flavipennis*.

Two males, Silcuri, 25th and 26th May, one female, Silcuri, 28th May.

Pithauriopsis, gen. nov.

Male.—Closely allied to *Pithauria*, Moore, but differing, in the *forewing*, in the distance between the origins of the second and third median nervules being greater, instead of less, than that between those of the first and second, in the submedian nervure being strongly sinuated where it comes into relation with, and the internal area expanded opposite to, a prominent bilobed discal glandular organ, extending from the root of the first median nervule for a short distance into the internal area, and consisting of two unequal slight depressions of the wing-membrane, separated from one another by the interno-median fold, and converted by over-arching stiff modified scales into pouches, which are filled with a soft and fine and adhesive brown woolly substance: and, in the *hindwing*, in the first subcostal nervule being at its origin strongly arched towards the costal, and the base of the second slightly bowed into the cell and more acutely angled at its junction with the disco-cellular nervule, in the subcostal, in fact, with its branches having the shape rather of a tuning-fork than of the letter Y; discoidal nervule absent, and only one disco-cellular consequently present, as in *Pithauria*.

The male genital somites and appendages, though at first sight appearing very different, yet when carefully examined are seen to be built on the same plan and to differ in characters of specific value only from those of *Pithauria*.

Female unknown.

233. Pithauriopsis aitchisoni, n. sp., Pl. XV, Fig. 4, ♂.

♂. Upperside, *both wings* rich bronzy-brown. *Forewing* with a basal streak on the costa, another in the cell, one in the submedian, and a fourth, the longest of all, filling the interno-median interspace, all composed of long yellowish-olivaceous hair-like scales; two oblong spots placed obliquely at the end of the cell, the anterior one the further from the base of the wing; two subcostal spots, the anterior one a mere dot; an oval or heart-shaped spot in the second median interspace; and a romboidal one in the space behind; all semi-transparent ochreous. *Hindwing* with all but the costal and outer margins clothed with very long yellowish olivaceous hairs. Underside, *forewing* blackish, with the costal and apical half of the wing yellowish-brown. The spots as above save that those in the cell are conjoined into an ill-shaped figure of 8, and that there is a submarginal series of yellowish dots from the first median nervule to the costa. *Hindwing* with a minute yellow spot in the subcostal interspace, two larger ones (the anterior the larger) in the median interspaces, a submarginal series of small obscure yellowish spots, the two of which in the submedian interspace are large and prominent, and a yellow streak on the abdominal margin. *Cilia* cinereous on the hindwing and at the anal angle of the forewing, in front of which point they are dark brown.

EXPANSE : 1·8 inches.

Two males, Irangmara, 6th and 29th July. This species agrees in markings almost exactly with the male of *Pithauria murdava*, Moore, but the large and curiously-formed sexual brand in the male will at once distinguish it.

234. PITHAURIA STRAMINEIPENNIS, n. sp., Pl. XV, Fig. 5, ♂.

♂. UPPERSIDE, *both wings* marked precisely as in *P. murdava*, Moore, but all the setæ on the base of the wings clear whity-brown with a touch of yellow on all those in front of the submedian nervure of the forewing, those on the interno-median area of this wing being concolorous with the whity-brown down of the hindwing, the costal area of which is above more or less extensively pale brown. In *P. murdava*, the setæ in the hindwing are yellowish-olivaceous, all those of the forewing distinctly yellower; and the costal area of the hindwing is dark. All the spots and streaks of both sides are no less variable in *P. stramineipennis* than they are in *P. murdava*, so we have not attempted to describe them.

♀. Differs from male in being larger, in the wings being paler, with the scanty setulose clothing at their bases greyish-fuscous paler than the ground in the hindwing, and in the spots of the forewing being larger, paler, and more angular; agrees therewith in the costal area of the hindwing being pale brown above.

HAB.—♂, Sikkim, Bhutan, Upper Assam, and Cachar; ♀, Sikkim.

EXPANSE: ♂, 1·8 to 2·0; ♀, 2·1 inches.

We have long known of the existence of two species of the genus *Pithauria* occurring in almost equal profusion in Sikkim and Bhutan, and we recently sent a male specimen of each to Mr. Moore to be named in order that we might know for certain to which the term *murdava* ought properly to be applied. Mr. Moore returned the dark one (which agrees with his figure in the Proc. Zool. Soc. Lond., 1878, pl. xlv, fig. 13) labelled "*P. murdava*, ♂", and the light one, our *P. stramineipennis*, "*P. murdava*, ♀." In describing *P. murdava*, he does not give the sex of the typical specimen, but his description, like his figure, applies best to the dark form. Mr. Distant appears to have fallen into the same error as Mr. Moore, correctly figuring as the male that which we have all along taken as the male of *P. murdava*, but describing the present species as its female.* We possess two specimens of the female of *P. murdava*, which differ from the single one of *P. stramineipennis*, in having the darker wings richly purple-glossed, with the very scanty setulose clothing of their bases conforming in colour to that of the male, and in the costal area of the hindwing being concolorous with the rest of the organ, as in the male.

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* *Pithauria murdava*, Distant, Rhop. Malay., p. 378, n. 1, *male* and *female* pl. xxxv, fig. 9, *male* (1886).

EXPANSE, 2·0 and 2·1 inches.

In our figure the downy clothing of the upperside of the wings at the base is not represented of a sufficiently light and bright shade; it is in reality of a clear bright whity-brown or straw-colour, which, being conspicuously contrasted with the dark margins, renders *P. stramineipennis* most readily distinguishable from *P. murdava*, in which the downy clothing is, as has already been stated, yellowish-olivaceous.

The genital armature, which has been carefully examined in several specimens of each species, though identical in general plan, yet differs greatly in detail in the two.

Some hundreds of specimens of each species have passed through our hands.

Two males, Silcuri and Irangmara, 30th June and 11th July.

235. THANAOS ? OBSOLETA.

T. obsoleta, Moore, Proc. Zool. Soc. Lond., 1878, p. 694.

One battered specimen only three-fourths of an inch in expanse at Silcuri, 21st June, and another in equally bad condition at Subong, 26th August.

236. HYAROTIS ADRASTUS.

Papilio adrastus, Cramer, Pap. Ex., vol. iv, pl. cccxix, figs. F, G (1780).

Thirty-nine examples of both sexes in forests around Silcuri, 25th May to 26th August.

237. TAGIADES ATTICUS, Pl. XVII, Fig. 10, ♀.

Hesperia atticus, Fabricius, Ent. Syst., vol. iii, pt. i, p. 339, n. 288 (1793).

One female, Subong, 29th August.

238. TAGIADES OBSCURUS, Pl. XVII, Fig. 9, ♀.

T. obscurrus, Mabille, Ann. Soc. Ent. France, fifth series, vol. vi, p. 274, n. 22 (1876).

One female, Silcuri, 29th May, agrees with examples so named by Mr. Moore.

239. TAGIADES RAVI.

Pterygospidea ravi, Moore, Proc. Zool. Soc. Lond., 1865, p. 779.

Twenty-one males and females in and around Silcuri, 25th May to 6th August.

240. SATARUPA PHISARA, Pl. XVII, Fig. 4, ♂.

S. phisara, Moore, Journ. A. S. B., vol. liii, pt. 2, p. 50 (1884); *Satarupa bhagava ?* de Nicéville, Journ. A. S. B., vol. lii, pt. 2, p. 90, n. 39, *part* (1883).

♂. UPPERSIDE, *both wings* dark sooty-black, the *cilia* cinereous. *Forewing* with eight semitransparent spots and dots, five dots forming an S-shaped subapical series, a slightly transversely elongated spot near the posterior angle of the cell, a second about the same size but squarer below and beyond this near the base of the second median interspace, and a third more than four times the size of the other two taken together, notched at both ends, and placed about the middle of the length of the wing in the first median interspace. *Hindwing* with a narrow and indistinct submarginal band lighter than the ground, which is coarsely mottled between it and a broadish whity-brown subbasal band with irregular margins that extends from the middle of the costal only to the internal nervure. *Head* and *thorax* with their appendages coloured much as in *S. bhagava*, Moore; but the *abdomen* is black above, with the segments edged posteriorly with scales concolorous with the alar band, whereas in *S. bhagava* the subbasal band extends right to the abdominal margin of the wings and crosses the abdomen, of which it covers two complete segments. UNDERSIDE, *both wings* marked as above.

Since the above was written this species has been described by Mr. Moore, to whom a Sikkim specimen had been sent by de Nicéville for comparison.

One male, Irangmara, 29th July.

241. SARANGESA DASAHARA.

Nisoniades dasahara, Moore, Proc. Zool. Soc. Lond., 1865, p. 787.

Five males, Silcuri and Silchar, 3rd April to 26th May.

242. UDASPES FOLUS.

Papilio folus, Cramer, Pap. Ex., vol. i, pl. lxxiv, fig. F (1775).

Twenty-two specimens of both sexes, Silcuri and around, 6th April to 6th August.

243. PLESIONEURA ALYSOS.

P. alysos, Moore, Proc. Zool. Soc. Lond., 1865, p. 789.

Six males, Irangmara, 8th to 28th July.

244. PLESIONEURA RESTRICTA, Pl. XVII, Fig. 5, ♂.

P. restricta, Moore, Lep. Cey., vol. i, p. 178 (1881).

One male, Silcuri, 16th, and another Sildubi, 28th June.

245. PLESIONEURA MONTEITHI, n. sp., Pl. XVIII, Figs. 3, 3*a*, ♀.

♀. UPPERSIDE, *both wings* rich dark brown with a vinous tinge in some lights. *Forewing* with a semi-transparent white lustrous disca band of four completely-conjugated spots, the first large and oblong at the end of the cell; the second posterior and external to it at the base of the interspace between the second and third median nervules, and consequently wedge-shaped; the third conterminous with the first and second, forming an oblong figure whose opposite angles are subequal, and placed in the interspace between the first and second median nervules; and the fourth subpentagonal, double the size of the second, and half the size of the first and third, but not extending for more than two-thirds of the distance across the submedian area in which it is placed. *Hindwing* unmarked. UNDERSIDE, *forewing* marked as above, but with the three subcostal streaks which connect the band with the costa much more distinct than above, where they are all but imperceptible; the lowest spot of the discal band much larger, reaching the submedian nervure, and outwardly diffused. *Cilia* concolorous with the wings.

EXPANSE: 1·7 inches.

Two females, Irangmara, 8th and 18th July. Closely allied to *P. feisthamelii*, Boisduval, from the Moluccas.

246. COLADENIA ANDAMANICA.

Plesioneura dan, var. *andamanica*, Wood-Mason and de Nicéville, Journ. A. S. B., vol. l, pt. 2, p. 257, n. 118 (1881).

One specimen in forest near Silcuri, 8th August, which agrees best with this species, but differs in the discal golden band on the upperside of the forewing being slightly broader and the yellow spots on the underside of the hindwing obsolete. It agrees with the *P. dhanada* of Moore (Proc. Zool. Soc. Lond., 1865, p. 789, from Masuri in the Western Himalayas) in the golden band not nearly reaching the anal angle of the forewing on the upperside (thereby differing from *P.* (*Kerana* apud Distant) *aurivittata*, Moore, Proc. Zool. Soc Lond., 1878, p. 843, pl. liii, fig. 2), departing from it in having the cilia cinereous throughout.

247. COLADENIA DAN.

Papilio dan, Fabricius, Mant. Ins., vol. ii, p. 88, n. 798 (1787).

Eleven specimens of both sexes from 22nd to 30th May.

248. ABARATHA SURA.

Achlyodes sura, Moore, Proc. Zool. Soc. Lond., 1865, p. 786.

Two males, Irangmara, 21st July and 2nd August.

We take this opportunity to give a more complete description of, and to figure twice the natural size from a Sikkim example, the striking little hesperid :—

249. CYCLOPIDES SUBVITTATUS, Pl. XVII, Figs. 6, 6*a*, ♂.

C. subvittatus, Moore, Proc. Zool. Soc. Lond., 1878, p. 692.

♂, ♀. UPPERSIDE, *both wings* iridescent vandyke-brown. *Forewing* with one, two, three, four, or five very small pure and bright chrome-yellow streaks divided by the veins placed obliquely beyond the end of the cell; or even immaculate; and with all the *cilia* lighter yellow than the spots when present, and broadly intersected with brown opposite to the ends of the veins. UNDERSIDE, *both wings* and the bases of the *cilia* throughout rich vandyke-brown, darker than above, and veined and margined with rich chrome-yellow. *Forewing* with the costal margin to a little beyond its middle, the costal and subcostal nervures and nervules to the costal and outer margins, and the extremity of the third median nervule veined, and the outer margin bordered, with chrome-yellow, so that the wing may be described as being increasingly bordered from the base to the apex, and decreasingly from the apex to the submedian nervure with yellow streaked with dark brown. *Hindwing* yellow-bordered, with the yellow veins broadly edged on both sides with yellow. *Antennæ* dark brown, ringed and tipped with chrome-yellow. *Head*, *thorax*, and *abdomen* above dark vandyke-brown, below yellow.

EXPANSE: ·90 to ·95 inches.

HAB.—Sikkim, where it is not uncommon at low elevations; Bhutan; and Salween, Moulmein, whence the type specimens were received.

The great variation in the number of the small chrome-yellow spots on the upperside of the forewing presented by our specimens from Sikkim and Bhutan suggests at least the suspicion that the *C. subradiatus* of Moore (Proc. Zool. Soc. Lond., 1878, p. 693) from the Khasia Hills is not specifically distinct from the *C. subvittatus* of the same writer.

EXPLANATIONS OF THE PLATES.

PLATE XV.

Fig. 1. *Enispe euthymius*, Doubleday, ♂.
Fig. 2. *Papilio nevilli*, W.-M., ♂.
Fig. 2*a*. ——— ——— W.-M., ♂.
Fig. 3. *Lehera skinneri*, W.-M. and de N., ♀.
Fig. 4. *Pithauriopsis aitchisoni*, W.-M. and de N., ♂.

Fig. 5. *Pithauria stramineipennis*, W.-M. and de N., ♂.
Fig. 6. *Catapœcilma elegans*, Druce, ♂.

PLATE XVI.

Fig. 1. *Mycalesis suaveolens*, W.-M. and de N., ♂.
Fig. 2. *Erites falcipennis*, W.-M. and de N., ♂.
Fig. 3. *Euthalia jama*, Felder, ♀.
Fig. 4. ———— ———— Felder, ♂.
Fig. 5. ———— *jahnu*, Moore, ♀.
Fig. 6. *Athyma zeroca*, Moore, ♂.

PLATE XVII.

Fig. 1. *Telicota augias*, Linnæus, ♂.
Fig. 2. *Taractrocera mævius*, Fabricius, ♀.
Fig. 3. *Isoteinon microstictum*, W.-M. and de N., ♂.
Fig. 3*a*. ———— ———— W.-M. and de N., ♀.
Fig. 4. *Satarupa phisara*, Moore, ♂.
Fig. 5. *Plesioneura restricta*, Moore, ♂.
Fig. 6. *Cyclopides subvittatus*, Moore, ♂, × 2.
Fig. 6*a*. ———— ———— Moore, ♂, × 2.
Fig. 7. *Parnara assamensis*, W.-M. and de N., ♀.
Fig. 7*a*. ———— ———— W.-M. and de N., ♀.
Fig. 8. *Halpe sikkima*, Moore, ♂.
Fig. 9. *Tagiades obscurus*, Mabille, ♀.
Fig. 10. ———— *atticus*, Fabricius, ♀.
Fig. 11. *Nacaduba cœlestis*, de N., ♂.
Fig. 12. ———— *viola*, Moore, ♂.
Fig. 13. ———— *macrophthalma*, Felder, ♂.

PLATE XVIII.

Fig. 1. *Astictopterus subfasciatus*, Moore, ♂.
Fig. 1*a*. ———— ———— Moore, ♂.
Fig. 2. ———— *olivascens*, Moore, ♀.
Fig. 2*a*. ———— ———— Moore, ♀.
Fig. 3. *Plesioneura monteithi*, W.-M. and de N., ♀.
Fig. 3*a*. ———— ———— W.-M. and de N., ♀.
Fig. 4. *Baracus septentrionum*, W.-M. and de N., ♂.
Fig. 4*a*. ———— ———— W.-M. and de N., ♂.
Fig. 5. *Parnara assamensis*, W.-M. and de N., ♂.
Fig. 5*a*. ———— ———— W.-M. and de N., ♂.
Fig. 6. ———— *eltola*, Hewitson, ♂.
Fig. 6*a*. ———— ———— Hewitson, ♂.
Fig. 7. ———— *ornata*, Felder, ♂.
Fig. 7*a*. ———— ———— Felder, ♂.
Fig. 8. *Hasora coulteri*, W.-M. and de N., ♂.
Fig. 8*a*. ———— ———— W.-M. and de N., ♀.
Fig. 8*b*. ———— ———— W.-M. and de N., ♀.

XX.—*On some New Species of* Ficus *from New Guinea.*—*By* George King, M. B., LL. D., F. L. S., *Superintendent, Royal Botanic Garden, Calcutta.*

[Received 31st December, 1886;—Read 5th January, 1887.]

Having been for some time engaged in the study of the Indo-Malayan species of *Ficus*, I have, in another place, suggested a new arrangement of the subordinate groups of which the genus is composed. Before proceeding to describe the new species from New Guinea which have recently come into my hands, it will be necessary to give a short outline of this new arrangement and of its morphological basis.

The flowers of the genus *Ficus* are collected in a hollow fleshy axis which forms a kind of flask, on the inner surface of which a number of flowers are arranged. The flowers at the bottom of the flask come to maturity first, those near its mouth being younger in point of development. These flower-bearing axes are called 'Figs' or 'Receptacles.' They vary in colour, form, size, and in the situation which they occupy on the plant. The hollow receptacle has walls of more or less fleshy texture, and its mouth is occupied by rows of bracts which, in the majority of cases, so interlock as practically to close it. The lower of these bracts often bend downwards into the cavity of the receptacle, curving round the upper flowers; the middle bracts are more or less horizontal in direction; while those towards the upper or outer part of the mouth project therefrom, so as to be visible externally and to form a more or less prominent apical umbilicus. In a few species, the mouth is surrounded externally by a more or less clearly defined annulus formed of coalesced bracts. So much for the receptacle. I may be permitted to quote the following description of the flowers contained in it from my forthcoming monograph on the Indo-Malayan and Chinese species of the genus, and from a paper sent to the Linnæan Society of London.

"The flowers, which are mostly unisexual, are situated on the inner walls of the receptacle. They may be either sessile or pedicillate. In some species they are separated from each other by scales or bracteoles, and in others by hairs, both of which appendages appear to be analogous to the *paleæ* that are found on the receptacles of many *Compositæ*. In other species the flowers lie close together, unseparated by any intervening appendages. Five kinds of flowers are found in the genus, *viz.*, male, pseudo-hermaphrodite, neuter, fertile female, and gall flowers. The structure of each of these is very simple. The male flowers consist of a perianth of from three to five pieces, which, although sometimes united, are usually free. The perianth sometimes hardly covers the stamen or stamens; in other cases it is large, inflated, and completely envelopes the stamen. In some species the pieces of the perianth are thin and colourless, and not unfrequently hyaline; in others they are of a red or dark-brown colour and opaque. In quite half the Indo-Malayan species there is only a single stamen; in very many there are only two; while in only a few are there so many as three. In shape the anthers are for the most part ovate or elliptic, although some are very broad and almost rotund; they are always 2-celled and have sutural dehiscence. Some are sessile or nearly so, and in very few is the filament long. The attachment of the anther to the filament is innate in most species; in a few, however, it is adnate. In species with two stamens the filaments are often united for the whole or part of their length, leaving the anthers, however, free.

"Pseudo-hermaphrodite flowers occur in only a few species. Such flowers have a perianth like the male flowers, but along with the single stamen there is present in them a pistil with completely formed style and ovary. I have, however, never found one of these ovaries to contain a seed, but I have not unfrequently found one containing a larva.

"Neuter flowers are found only in the few species forming the section *Synoecia*. They are long-pedicillate, have a 3-leaved perianth, and are without any trace of either anther or pistil.

"Fertile female flowers have a perianth not very different from that of the males, but consisting in many cases of more pieces, and being more often gamophyllous. In the case where the pieces of the perianth are free, the individual pieces are sometimes rather easily detached, and are very apt to be confounded with the bracteoles of the receptacles in species where the latter exist. The perianth is usually much smaller than the mature achene, and covers the latter very incompletely or not all. In some cases where the perianth is gamophyllous it forms a small cup, which surrounds only the base of the ovary or its pedicel. It was in some such cases, where the perianth is hyaline, that Miquel was led to believe that none existed; and hence his statement about the perianth being absent in *Covellia*. The pistil may be sessile, but it is very often pedicillate; the ovary is more or less ovoid or obovoid, with a tendency to be emarginate on the side at which the style it attached. It contains a single pendulous ovule. The style is filiform, and is in most cases distinctly lateral or sub-terminal: it rarely springs from the apex of the ovary. In length the style usually greatly exceeds the ovary: it is usually smooth, but in a few species it is hairy. The stigma, which is papillose, varies in shape, being cylindric, clavate, peltate, or infundibuliform; and in a few cases it is flat. In many species it is obliquely truncate, and in not a few bicrural. It is, however, often very difficult to determine the exact form of the stigma, from the fact that at an early stage the stigmas of the fertile female flowers of the same receptacles are joined together in a dense felted mass, from which it is nearly impossible to detach any individual in a state of entirety. After fertilisation, the ovary becomes developed into an achene which tends to be unilaterally emarginate (many achenes are very distinctly reniform), and the style becomes more lateral, or even basal. The ripe achene has a crustaceous pericarp of a pale yellow colour and with a more or less minutely tuberculate or undulate surface. External to the crustaceous coat, there is occasionally a glairy or viscid layer. The pericarp is never very thick, and sometimes it is conspicuously thin. On cutting the achene open the embryo is seen with a small amount of albumen. I have not, however, paid much attention to the relation of the albumen to the embryo. Not a few of the perfect female flowers fail to be fertilised. But the fact of the barrenness of such is not recognisable until the achene has been cut open, and they are found to contain no embryo. Externally these infertile achenes exactly resemble those containing embryos.

"Besides the above four kinds of flowers, there occur, in all the species of *Ficus* which I have examined, a set of flowers which, adopting the name given to them by Count Solms-Laubach, I call *gall* flowers. My own name for these was originally *insect-attacked females;* but Count Solms-Laubach's name being much shorter and more suitable, I have adopted it. The existence of these gall flowers, as a separate and distinct kind of flower in this genus, was first made publicly known by the distinguished botanist just mentioned, in *Botanische Zeitung*, Nos. 33 to 36 for 1885. My own observations and inquiries on *Ficus* have been in progress since 1878, but on account of my unwillingness to publish anything until I had completed my research, I have been anticipated in the publication of the facts about gall flowers. The gall flowers in many respects resemble the fertile female flowers: they have in most cases a similar perianth, an ovary, and a style. When fully developed, they are recognised at a glance by their containing the larva of an insect, which can often be seen through the pericarp of the false achene into which the ovary develops. But whether the larva be visible or not, or whether it be present or not, the false achene of the gall flower may, in its later stages, be distinguished from the true achene of the fertilised ovary of the perfect or fertile female flower by being more often pedicillate, and by its shape being usually globular and rarely elliptic or reniform; by its surface being smooth, not minutely tubercular or undulate, and never viscid or glairy; and frequently also by the tense, distended appearance of tough membranous wall (false pericarp). The style is, as a rule, much shorter and straighter than the style of the fertile female flower, and more terminal; and it has very frequently a dilated tubular apex which occupies the situation of the true stigma, but has often little or none of the viscid parenchyma characteristic of that organ. These peculiarities in the nature of the stigma and the shortness of the style are apparent in the gall flowers of many species from a very early stage. They are not consequences of the deposit of the egg of an insect in the ovary, but, as Count Solms-Laubach points out (*Bot. Zeitung*, l.c.), such original peculiarities in the style and stigma of the gall flower may rather determine the selection of it by the insect as the nidus for its egg; for in many of the species of *Blastophaga* and of some other Hymenopterous genera which visit figs, the ovi-positors are not long enough to reach down the longer and more curved styles of the perfect female flowers. There are, however, many species of *Ficus* (more especially in the group *Urostigma*) in which the gall and fertile female flowers are not characterised by any marked differences in the form of style and stigma, and it is only by cutting the ovaries open that the two can be distinguished.

"Now there is probably nothing in itself very remarkable in the mere occurrence in the genus of numerous flowers having the general form of females, which yet, by reason of certain peculiarities in their structure, are incapable of fertilisation by pollen and are practically barren, while at the same time their very structural defects fit them for becoming the nidus for the eggs of special insects. But when the manner in which these malformed female flowers are disposed in the receptacles is inquired into, it becomes clear that, through the interposition of insects, these malformed females play a most important part in the life-history of many species of the genus. In all the species, except those included in the section *Urostigma*, the gall flowers occupy the same receptacles as the males, while the fertile female flowers occupy different receptacles. In other words, the majority of the species have two distinct sets of receptacles—one set containing male and gall flowers, but no fertile female flowers, and another set containing only fertile female flowers without any trace of either male or gall flowers. The proportion of males to gall flowers in receptacles of the former kind varies. In all (excepting the *Urostigmas* just mentioned) it is the rule to find the males confined to a zone of greater or less width at the apex of the receptacle just under the scales which close its mouth. Sometimes this zone is very narrow indeed, and consists of only a single row of male flowers, and that row not always a complete one; the remaining part of the interior of the receptacle being occupied by gall flowers.

In by far the majority of cases these two kinds of receptacles, so physiologically distinct, are undistinguishable by external characters, and they are both borne by the same individual plant. They look exactly alike until one cuts them open and examines their contents. The most notorious of the few exceptions to this rule is the common eatable fig (*Ficus Carica*), in which species the male and gall flowers occupy elongated receptacles borne on one set of individual trees, while the fertile female flowers occupy more or less globular receptacles which are borne by a different set of trees. So different in appearance are the two kinds of receptacles in *F. Carica*, that the trees bearing them (although they have similar leaves) have almost from time immemorial been considered distinct species, known by distinct names—the former being called the Caprifig, the latter the Fig.

"In the majority of the gall flowers an insect deposits an egg, and many of them contain a larva which is easily seen through the coats of the false achene. The larva escapes into the cavity of the receptacle by cutting its way through those coats, and the fully developed winged insects are often to be found in considerable numbers in the cavity of the fig, the opening by which each escaped from the ovary in which it was developed being clearly visible. The perfect insects escape from the cavity of the receptacle into the open air by perforating a passage through the scales that close the mouth of the latter. The egg of the insect must in most cases be deposited in the ovary of the gall flower at a very early period; for, about the time at which the pupa is escaping from the ovary, the pollen of the anthers of the male flowers is only beginning to be shed. It is quite clear therefore that the synchronism of the two events—the escape of the insect and the maturity of the pollen—is an arrangement of much physiological significance. In the species of *Ficus* in which the arrangement just described obtains (and these are by far the majority), the perfect female flowers are contained in receptacles which are consecrated to themselves alone. In these receptacles the flowers are all perfect females. There is not a trace of a male or of a gall flower. These receptacles in many species are perfectly closed from a very early stage, and yet, in the majority of cases, every one of the ovaries of the females they enclose contains, when mature, a perfect embryo. The exact way in which these females are pollenised is a matter on which I cannot pretend to throw any light. I can only state the problem. The males are shut up from an early age with a number of females, the structure of whose organs is unfavourable to pollenisation. No pollen is produced by the males that are shut up with these females until all possibility of their becoming fertile with pollen has been precluded by the deposit within each of their ovarial cavities of the egg of an insect. On the other hand, a number of perfectly formed females, *all well adapted for the reception of pollen*, are shut up together in a receptacle which contains neither male nor gall flowers, and to which it must from a very early stage be very difficult for pollen-bearing insects to get access. Yet each of the females situated in such apparently disadvantageous circumstances bears a well-formed embryo. No doubt the *Blastophaga* or other Hymenopterous insect developed in the gall flowers, in some way, conveys the pollen of the males to the perfect females imprisoned in the neighbouring receptacles. But although one can understand that it is to the advantage of the insect to enter the receptacle containing the gall flowers, since these afford it such a suitable nidus for its egg, and that the mature insect in escaping from these receptacles may, inadvertently carry along with it some of the pollen which the anthers are then shedding, yet it is difficult to understand how the pollen so removed is conveyed into the interior of the receptacle containing the perfect female flowers, and how these females are so universally fertilised by it.

"This arrangement, by which the receptacles are practically diœcious, obtains, as I have said, in a large proportion of the species of *Ficus*. There is, however, a group of species (*Urostigma*) in which it does not obtain, and in which male, fertile female, and gall flowers are contained in the same receptacle. In this group the difference in structure in the early stages between gall and fertile female flowers is very slight, and in some cases I could find no difference whatever. And even the ripe achenes of the fertile females are in many cases undistinguishable externally from the ovaries containing far advanced pupæ, and it is only by cutting them open that they can be recognised. As regards the relation in this group of *Urostigma* of the male flowers to the fertile female and gall flowers, there are two types of arrangement. In one set of species (of which *F. Bengalensis* and *tomentosa* are good examples) the male flowers are comparatively few in number, and are confined to a zone at the apex of the receptacle, just under the ostiolar scales; while in another set the male flowers are intermixed with the fertile female and gall flowers over the whole surface of the interior of the receptacle.

"A third small group (*Synœcia*) has neuter flowers mixed with the fertile females in one set of receptacles; while the other set of receptacles contain only male and gall flowers. And a fourth group (which I have named *Palæomorphe*) has male flowers which, in addition to an anther, contain an insect-attacked or gall pistil. These pseudo-hermaphrodite flowers are confined to the sub-ostiolar zone, the remainder of the receptacle being occupied by gall flowers: while perfect female flowers occur in a distinct set of receptacles and are unaccompanied by any trace of male or gall flowers.

"It appears to me that, in the peculiarities in the structure and arrangement of the flowers which I have above described, the evolutionary history of the genus *Ficus* may to some extent be traced. I have therefore ventured to arrange the Indo-Malayan species into two great groups, and to divide the second of these great groups into three sub-groups, according to their presumed seniority. Believing that hermaphroditism is an archaic and primitive condition from which the genus is in process of delivery, I look on its persistence, even in an imperfect form, as an indication of age. I have therefore separated off the ten species in which I find it regularly to occur into a distinct group. Of this group pseudo-hermaphroditism is the diagnostic mark; and to the section which these ten species form I have given the name *Palæomorphe.* It is true that, in the whole of these ten species, the pseudo-hermaphrodite flowers are confined to the same receptacles as the gall flowers; while the perfect females are confined to a distinct set of receptacles in which there is no trace of either males or galls, and that the receptacles are thus practically diœcious. Still it appears to me that the persistence of the rudimentary female organ in the male flowers must be taken as indicating a more primitive condition than the enclosure in the same receptacle of strictly unisexual male and female flowers (the arrangement obtaining in *Urostigma*). These ten species being disposed of in a group by themselves, I have formed the remaining species of Indo-Malayan *Ficus* into a group characterised by unisexual flowers. And that group I have divided into three sub-groups, according as the receptacles are monœcious, pseudo-monœcious, or practically diœcious, the practically diœcious sub-group being again subdivided into sections which are founded on the number of the stamens and the situation of the receptacles. For five of the seven sections into which I have thus thrown the Indo-Malayan species, I have adopted, as sectional designations, words previously in use as sectional or subgeneric names. For the first section, as already stated, I have invented a new name, which indicates what I believe to be its position in the evolution of the genus, and for the seventh I have also invented a name, indicating its juniority in point of evolution. The arrangement is as follows:—

GROUP I.—PSEUDO-HERMAPHRODITE; male flowers with 1 stamen and a rudimentary pistil.

Pseudo-hermaphrodite flowers and gall
flowers in one set of receptacles:
fertile female flowers in another set *Palæomorphe.*

GROUP II.—UNISEXUAL OR ASEXUAL; male flowers without rudimentary pistils.

SUB-GROUP I.—Male, gall, and fertile female flowers on the same receptacle ... *Urostigma.*

SUB-GROUP II.—Flowers unisexual or neuter: male and gall flowers in one set of receptacles, fertile female and neuter flowers in another set .... *Synœcia.*

SUB-GROUP III.—Flowers unisexual: male and gall flowers in one set of receptacles, fertile female flowers only in another set—

- A.—Flower monandrous—
  - *a*, Receptacles chiefly axillary .... *Sycidium.*
  - *β*, Receptacles mostly in fascicles from stem and branches............ *Covellia.*
- B.—Flowers di-, rarely triandrous—
  - *a*, Receptacles mostly axillary .... *Eusyce.*
  - *β*, Receptacles mostly in fascicles from stem and branches .... *Neomorphe.*

Amongst the new species which it is the chief object of this paper to describe there are none belonging to the sections *Palæomorphe* or *Neomorphe.* The species are as follows :—

UROSTIGMA.—Male, fertile female, and gall flowers in the same receptacle ; stamen usually 1 ; stigma elongate, usually acute ; receptacles in the axils of the leaves or of the scars of fallen leaves, tribracteate at the base ; leaves alternate, entire, coriaceous, or sub-coriaceous, rarely membranous ; usually trees or powerful climbers ; epiphytal at least in early life.

Ficus hesperidiiformis, King ; a tree, glabrous in all parts except the stipules which are minutely tomentose externally ; young branches hollow, thick, marked with annular scars ; leaves coriaceous, alternate, broadly elliptic-oblong, gradually tapering towards the apex which ends in a short rather blunt point, the base rounded, edges entire ; lateral primary nerves very numerous (40 or 50 pairs) running nearly at right angles from the thick prominent midrib and anastomosing about ·1 in. from the edge, secondary nerves and reticulations minute but distinct, the petiole from $\frac{1}{3}$ to $\frac{1}{2}$ as long as the blade ; stipules very large, coloured, convolute, minutely tomentose on the outer, smooth on the inner surface ;

length of blade and of stipules 6 to 9 in., petioles 2·5 in. to 4·5 in.; receptacles large, axillary, solitary, pedunculate, globose, smooth, apparently without basal bracts, about 1·5 in. in diam., the walls very thick; male flowers numerous, pedicellate, anther single, sub-sessile, ovoid, its walls thick and cartilaginous, the dehiscence lateral, perianth gamophyllous with 3 oblong blunt segments; gall flowers with hard, crustaceous, 3-sided ovary, thick short pedicel, and no perianth other than the long, linear, subulate scales which spring from the walls of the receptacle between the flowers; fertile female flowers not seen.

New Guinea; H. O. Forbes, No. 737.

The material in my possession is not very abundant, and I have not had the advantage of seeing Mr. Forbes's field notes. I presume this is a tree. The leaves and stipules at once recall to mind those of *F. elastica*. But the leaves of this are larger and the stipules are tomentose externally. The receptacles are quite different from those of *elastica*, being greatly larger and of a globular, not an ovoid, shape. When dry, the receptacles a good deal resemble a small orange.

Ficus Edelfeltii, King; a tree, the bark of the young shoots pale and slightly puberulous, all the other parts glabrous except the midribs of the leaves and the receptacles; leaves alternate, thinly coriaceous, shortly petiolate, from oblong to obovate-elliptic, gradually narrowed to the rounded 5-nerved base, the apex rather suddenly contracted to a short blunt acumen, the edges entire and slightly undulate; primary lateral nerves about 9 pairs, prominent on the lower surface and forming bold intramarginal arches, the midrib prominent, sparsely adpressed-pubescent; the rest of the lower surface glabrous and shining, the minor nerves and reticulations strongly marked; upper surface dull, darker than the lower; length of blade 6 to 8 inches, width 3 to 3·25 in.; petioles ·5 in. long: stipules slightly shorter than the petiole, lanceolate, convolute; receptacles axillary, in pairs, pedunculate, globular, with a projecting cylindric pubescent umbilicus, the sides pubescent when young, nearly glabrous when adult, from ·6 in. to ·75 in. in diam., basal bracts 3, small, reflexed; peduncle about ·1 in. long, tomentose; male flowers only near the mouth of the receptacle, sessile, the stamen elliptic, on a short thick filament, perianth of 5 narrowly semi-lunar pieces; gall flowers with a globular smooth, thin, naked ovary and a short lateral style, the perianth like that of the male: fertile female flower with an ovoid, rather flattened, minutely tuberculate achene, and a filiform lateral style much longer than the ovary, the stigma triangular, perianth of 4 broadly semi-lunar pieces.

New Guinea, H. O. Forbes, No. 59, and probably also 409, of which I have not complete specimens.

In foliage this species much resembles the Indian *F. nervosa*, Heyne; but the receptacles of this are much larger. Its nearest ally is, however, *F. pubinervis*, var. *Teysmanni*, which it almost exactly resembles in the form, texture, and nervation of its leaves. The flowers, however, of the two differ, and I have no doubt they are distinct species.

Ficus Lawesii, King; a tree, all its parts quite glabrous, the bark of the young shoots pale and shining; leaves petiolate, thickly membranous, ovate-oblong or narrowly elliptic, entire, the base rounded 3-nerved, the apex gradually narrowed to a very short blunt point; lateral primary nerves diverging from the bold midrib at a wide angle, about 10 pairs, not very prominent on either surface, the reticulations small and rather distinct on the lower surface; both surfaces quite smooth but rather dull when dry; length of blade 5 to 6 inches, width 2·5 in.; petiole 1 in. to 1·25 in.; stipules narrowly lanceolate, convolute, rather more than half as long as the petiole; receptacles crowded near the ends of the branches, in pairs, sessile, cylindrico-globose, ·5 in. in diam., contracted at the base into a short thick pseudo-stalk, umbilicus composed of 3 large, thick smooth triangular scales, the sides smooth; basal bracts coalescing into an irregular ring: gall flowers sessile, the ovary prismatic, conical, smooth, style and stigma absent: male and fertile female flowers unknown.

New Guinea: H. O. Forbes, No. 85. From its general *facies*, I have no doubt that this is a *Urostigma* near *nervosa*. The receptacles, however, in the only two specimens I have seen, are diseased; and only the gall flowers can be distinguished.

I have named this after the Rev. W. G. Lawes, one of the devoted band of missionaries settled on the south-eastern coast of N. Guinea who have done so much in the way of collecting.

Ficus casearioides, King; a glabrous tree, the leaves on long petioles, thinly coriaceous, alternate, entire, broadly ovate-elliptic, tapering much to either end, the base acute, 3-nerved, the apex suddenly and shortly triangular-acuminate; lateral primary nerves 8 to 10 pairs, nearly at right angles to the midrib and like it strongly marked on the under surface, which is minutely tuberculate-tesselate; length of blade 5 to 6·5 in., breadth 2·75 in. to 3·25 in., petiole 1·5 in.; stipules lanceolate sub-convolute, ·6 in. long; receptacles axillary, in pairs, on long slender peduncles, ·5 in. in diam., depressed globular with a slight stalk-like construction at the base, smooth, basal bracts 3, minute; peduncles ·75 in. long: male flowers sessile, the single anther broadly ovate, sub-sessile; the perianth of 3 obovate pieces: gall flowers sub-sessile or pedicillate, the ovary smooth with thick crustaceous walls, the style short, lateral; the stigma infundibuliform; perianth of 4 or 5 oblong pieces which closely invest the ovary; female flowers like the galls but with a shorter more globose ovary and a longer style: all three kinds in the same receptacle.

New Guinea, H. O. Forbes, No. 568.

The leaves of this a good deal resemble those of *F. casearia*, Mull., but the structure of the flowers is different. The affinities of this in the section *Urostigma* are with *nervosa*.

SYNOECIA.—Flowers unisexual or neuter: male flowers with 1 stamen: male and gall flowers in one set of receptacles, fertile female and neuter flowers in another set; climbers with large coloured receptacles, the leaves tesselate beneath.

Ficus Scratchleyana, King; scandent, glabrous except the receptacles which are minutely sub-tomentose; leaves petiolate, coriaceous, entire, narrowly elliptic-oblong, gradually tapering to either end, the base minutely cordate, 3-nerved; the apex with a short blunt point; under surface tesselate; primary lateral nerves 5 or 6 pairs, prominent beneath, as is the midrib; length of blade 5 to 7 in.; width 1·75 in. to 2·25 in.; petioles 1 in. to 1·5 in. long; stipules subulate, convolute, about ·5 in. long.; receptacles axillary, solitary, pedunculate, ovoid-globose, minutely sub-tomentose, with a prominent umbilicus, about 1 inch in diam., basal bracts 3, small; fertile female flowers pedicillate, the perianth of 4 linear pieces, ovary ovoid-elliptic, the style lateral; stigma large, bicrural when young, truncate when adult from the absorption of the arms; neuter flowers mixed with the females all over the receptacle, pedicillate, the perianth of 4 lanceolate pieces: receptacles containing male and gall flowers not seen.

New Guinea, H. O. Forbes, No. 900.

This is well distinct from any other species of this group. Its nearest ally is *F. apiocarpa*, Miq.

SYCIDIUM.—Flowers unisexual: male and gall flowers in one set of receptacles; fertile female flowers in a distinct set of receptacles; male flowers with 1 stamen (sometimes 2). Leaves alternate; receptacles small, axillary, more or less scabrid (a few have receptacles in fascicles from the stem); shrubs, small trees or climbers; rarely epiphytal.

Ficus Armiti, King: a climber; the young shoots covered with short, buff-coloured tomentum; leaves alternate, shortly petiolate, membranous, ovate-lanceolate, with a long acuminate apex, the base rounded or sub-cordate 5 to 7-nerved, the edges entire; primary lateral nerves 5 to 7 pairs, diverging from the midrib at rather a wide angle, lower surface minutely tuberculate, hispid especially on the midrib and nerves, the longer hairs with black enlarged bases; upper surface scabrid, the midrib minutely hispid; length of blade 2·5 in. to 3.;

breadth 1·25 in.; petioles ·2 in. long, tomentose; stipules, 2 to each leaf, subulate, rather longer than the petioles, tomentose at first, but ultimately glabrous; receptacles axillary, solitary, pedunculate, sub-globular, with rather a prominent umbilicus, shortly, hispid-tomentose when young, glabrescent when mature, ·2 in. to ·25 in. in diam.; basal bracts none, but a few irregular broad fleshy bracts along the sides; peduncles slender, about ·2 in. long, tomentose; male flowers numerous near the mouth of the receptacle, the perianth of 3 lanceolate pieces; anther single, broadly ovate, on a long stout filament; gall flowers with a pedicillate gamophyllous perianth which is deeply cleft into 4 linear curving lobes which embrace the ovoid, smooth, shining ovary: style lateral, from near the apex of, and half as long as, the ovary; stigma infundibuliform; female flowers unknown.

New Guinea; H. O. Forbes, No. 609. This species approaches *F. ampelas*, Burm., but its leaves are more inclined to be cordate at the base and acuminate at the apex, and they are less scabrous and more hairy on the under surface; while the receptacles are larger, more hairy when young, and on longer peduncles, than in that species.

I have named this after Mr. Armit, of the *Argus* Expedition for the exploration of New Guinea.

COVELLIA.—Flowers unisexual; male flowers in the same receptacles as the gall flowers, monandrous, the perianth of 3 or 4 distinct pieces: female flowers in separate receptacles from the males and galls, pedunculate or sessile, the perianth gamophyllous, much shorter than the ovary, or wanting, (rarely consisting of 4 or 5 pieces); the receptacles on long sub-aphyllous branches issuing from near the base of the stem, often sub-hypogæal; or on shortened branchlets (tubercles) from the stem and larger branches; or axillary: shrubs or trees, never epiphytes or climbers.

Ficus Miquelii, King: *F. caulocarpa*, Miq. in Ann. Mus. Lugd. Bat. iii; 235, 297 (not *Urostigma caulocarpa*, Miq. in Lond. Journ. Bot. VI, 568); *F. fistulosa*, Kurz (not of Reinw.), Forest Flora B. Burmah, II, p. 459, (partly): a tree, the young branches adpressed-strigose; leaves alternate or sub-opposite, membranous, obovate-oblong or oblanceolate, the apex suddenly contracted into a narrow tail about I inch long, edges entire, base much narrowed 3-nerved; lateral primary nerves 6 to 8 pairs forming an obtuse angle with the midrib; both surfaces pubescent when young, becoming when adult almost glabrous; length of blade 4·5 to 8 inches; petioles from ·3 to ·5 in.; stipules lanceolate, pubescent externally, ·35 in. long; receptacles borne on rather large, panicled, scurfy, shortly bracteolate branches, which issue from the stem, pedunculate, depressed-globular, pubescent, greenish when ripe and with pale stripes, about ·75 in. across; umbilical scales numerous, rather broad; basal bracts 3, ovate-acute; peduncles ·75 in. long; male flowers only near the ostiole, sessile, the perianth inflated, of three broadly ovate much imbricate pieces; anther broadly ovate, its apex emarginate, sub-sessile; gall flowers sub-sessile or long-pedicillate, without perianth, the ovary ovoid-globose, smooth; style short, lateral; stigma tubular; fertile female flowers without perianth, pedicillate, the achene obovoid, minutely tuberculate; style as long as ovary, lateral; stigma, cylindric. Celebes, De Vriese; Singapore, King; Sumatra, Beccari; (Becc. Herb, P. S. Nos. 544, 631, 761); Perak, King's Collector, Nos. 1883, 955; Burmah, Kurz, No. 1520, 3145; New Guinea, Forbes, No. 903.

This species is allied to *F. botryocarpa*, Miq. by the short, much branched receptacular panicles. This is the plant which Miquel described as *Covellia caulocarpa;* but as he had already described a *Urostigma caulocarpa*, it became necessary to find a new name for this, and I have taken the opportunity of re-naming it after that distinguished botanist.

Ficus Chalmersii, King; a tree, the young shoots slightly swollen at the nodes, the bark dark brown with short pale adpressed hispid hairs: leaves alternate, thickly membraneous, ovate-lanceolate to ovate-oblong, tapering gradually to the slightly unequal, bluntish or sub-acute, 3-nerved base, and to the sharply, but shortly acuminate, apex; the edges entire or obscurely and remotely sub-serrate; primary lateral nerves about 7 pairs, minutely adpressed-hispid on both surfaces; the remainder of the lower surface of the leaf glabrous, of the upper surface minutely adpressed-hispid; length of blade 5 or 6 inches; petiole about ·5 in. long, adpressed-hispid; stipules, in pairs, lanceolate, glabrous except a few stiff hairs near the base externally, ·5 in. long; receptacles on short woody racemes from the stem and larger branches, pedunculate, in pairs, when young broadly pyriform with concave apex and much depressed umbilicus, smooth, ·75 in. or upwards in diam.; basal bracts 3, broadly triangular, united into a cup; peduncle thick, about ·25 in. long; female flowers (when young) narrowly ovoid-elliptic, the style short, thick, terminal, with a dilated discoid tubular stigma; the perianth gamophyllous, half as long as the ovary and closely applied to it; ripe female, male and gall flowers unknown.

New Guinea; H. O. Forbes, No. 100. A species near *brachiata*, King, but not so glabrous, and with its receptacles borne on much shorter branches than in that species.

Named after the Rev. J. Chalmers, the intrepid Missionary explorer of New Guinea.

Ficus Bernaysii, King: a tree? the young shoots fulvous-tomentose: leaves alternate, shortly petiolate, membranous, inequilateral, obovate-elliptic, tapering gradually from above the middle to the bluntish, very unequal, obscurely 5-nerved, base, and rather suddenly to the shortly acuminate apex; the edges minutely serrate; the whole of the under surface shortly fulvous-tomentose; primary lateral nerves 7 pairs; upper surface shortly adpressed-hispid, tomentose on the midrib and nerves; length of blade about 7 inches, petioles under ·5 in.; stipules tomentose externally, glabrous internally, convolate, ·5 in. long; receptacles on long peduncles, in short crowded panicles, from the stem and larger branches, puberulous, sub-globose, about ·25 in. in diam., contracted at the very base into a short pseudo-stalk, at the junction of which with the peduncle proper are 3 small triangular basal bracts: peduncle proper nearly ·5 in. long: young female flowers with a flattish ovoid, smooth, ovary; the style nearly as long as the ovary, lateral, curved, hairy; the stigma cylindric; perianth gamophyllous, very short, covering only the stalk of the ovary; ripe female, male and gall flowers unknown.

New Guinea; H. O. Forbes, No. 625. A species which, in the form and arrangement of its receptacles, resembles *F. condensa*, King, and in its leaves approaches *stipata*, King, *fasciculata*, King, and *Forbesii*, King.

Named in honour of Mr. L. Bernays, of Brisbane, whose efforts for the exploration of New Guinea, and for the development of his own Colony of Queensland are so well-known.

EUSYCE.—Flowers unisexual, male and gall flowers in one set of receptacles, fertile female flowers in a distinct set of receptacles; male flowers with 2 stamens; receptacles small, axillary; scandent or erect shrubs or small trees, rarely epiphytal; the leaves alternate, softly hairy or glabrous, not scabrid or hispid.

Ficus Pantoniana, King; a glabrous climber; leaves alternate, shortly petiolate, coriaceous, almost exactly oval or ovate-oblong, entire, the apex slightly acute, the base rounded or sub-cordate 3-nerved; primary lateral nerves 4 pairs, rather prominent on the lower surface, which has wide obscurely tesselate reticulations; length of blade 3 or 4 inches, width 1·5 in. to 2 in.; petiole rather under ·5 in.; stipules ovate-acute, glabrous, ·3 in. long, receptacles in pairs from the axils of the leaves, but mostly from the scars of fallen leaves, smooth, globular, ·4 in. in diam. produced at the base into a pseudo-stalk nearly ·5 in. long, at the junction of which with the peduncle proper are 3 minute bracts; female flowers pedicillate, the perianth deeply 4-cleft, the lobes shorter than the ovate-oblong, smooth, pale-edged, ovary: style thick, lateral; stigma widely infundibuliform: male and gall flowers not seen.

New Guinea, H. O. Forbes, No. 185. I have not seen the receptacles of this which contain the male and gall flowers; but I put it into this section with some confidence from its resemblance, in externals as well as in the structure of the female flowers, to *F. disticha*, Bl.

I have named it in honour of Mr. J. A. Panton, a distinguished Australian explorer.

Ficus Baeuerleni, King: scandent, the young shoots puberulous; leaves coriaceous, shortly petiolate, ovate-oblong or elliptic-lanceolate, the base rounded or subcordate 5-nerved (2 of the nerves minute), the apex gradually narrowed to a short point, the edges entire; primary lateral nerves 4 or 5 pairs, very bold (as is the midrib) on the under surface which is uniformly covered with very short soft brown tomentum; upper surface minutely tuberculate; length of blade about 7 inches, petiole ·4 in.; stipules convolute, pilose externally, rather longer than the petioles; receptacles axillary, pedunculate, solitary or in pairs, depressed-globose, nearly 1 inch in diam., contracted at the base into a short pseudo-stalk, at the junction of which with the peduncle proper are 3 broadly triangular basal bracts; peduncle proper ·25 in. long, tomentose; female flowers with a perianth of 4 distinct fleshy pieces which are shorter than the narrowly ovoid, smooth, ovary; style slender terminal; stigma halbert-shaped; male and gall flowers not seen.

New Guinea; H. O. Forbes, No. 378.

This has a general resemblance to *F. recurva*, Bl., in the form and venation of its leaves and in the perianth of the female flowers. It is, however, well distinct by the larger size of all its parts, but especially of its receptacles which are ten times as large as those of *recurva*, besides being pedunculate and of a different shape. This also resembles *lasiocarpa*, Miq.

I have named this after M. Baeuerlen, of the expedition sent by the Geographic Society of Australasia for the exploration of New Guinea.

Ficus duriuscula, King, Monog. Indo-Malayan and Chinese *Ficus*; a tree, all parts glabrous but rather harsh and sub-scabrid; leaves petiolate, membranous, elliptic narrowed to each end, or elliptic-lanceolate, the apex rather shortly acuminate, the edges undulate sub-crenate, base boldly 3-nerved biglandular; primary lateral nerves 4 to 6 pairs, thin but strong, as are the midrib and secondary nerves; reticulations minute, very distinct on the lower surface; both surfaces glabrous, the lower harsh to the touch; length of blade 5 to 10 inches; petioles swollen at either extremity, varying in length from ·5 in. to 1 inch; stipules lanceolate, glabrous, ·25 in. long; receptacles axillary or in fascicles of from 3 to 6, from small broad flat ebracteate tubercles from the stem and larger branches, pedunculate, globose, their sides slightly ridged towards the sub-umbonate apex, glabrous, muriculate-scabrid, ·5 in. across, base slightly constricted, ebracteate; peduncle thin, ·4 in. to ·8 in. long, with a few small scattered bracteoles, scabrid; male flowers with 2 stamens and a 5 or 6-cleft hairy perianth; gall flowers with a perianth similar in shape but not hairy, the ovary ovoid, the style short, lateral; fertile female flowers with the achene ovoid, smooth, mucilaginous externally when ripe; the style lateral, longer than the ovary, curved; the stigma clavate; the perianth as in the gall flower.

New Guinea, (Soron) Sig. Beccari (Herb. Becc. P. B., No. 188); H. O. Forbes, No. 765.

A species allied to the Australian *F. magnifolia*, Mull. and to *Madurensis*, Miq. but with shorter petioles and more muricate receptacles. It also comes near *brevicuspis*, Miq., but its leaves are not obovate and their bases are not cordate as in that species; they are moreover longer, more pointed, and have shorter petioles. This also resembles *F. balica*, Miq. and *F. copiosa*, Steud. This, however, has two stamens, while the majority of those just mentioned have but one. The receptacles in Forbes's specimens are axillary and are more boldly muricate than in Beccari's No. 188: the leaves are also rather longer. When better material shall be forthcoming, it may be possible to separate these two forms specifically. At present I include them under one species.

Ficus Odoardi, King: Monogr. Indo-Mal. and Chinese *Ficus;* a tree, the young shoots covered with brown tomentum, the leaves oblong-elliptic, slightly inequilateral, gradually narrowed upwards to the shortly acuminate apex, the edges entire; the base broad, rounded, very slightly emarginate, 3-nerved; primary lateral nerves 5 pairs, prominent on the lower surface which is pretty uniformly hispid-pilose; upper surface slightly harsh and with some scattered stiff hairs especially on the nerves, the midrib minutely tomentose; length of blade from 6 to 9 inches; petiole about ·3 in., tomentose; stipules ovate-acuminate, tomentose on the outer, glabrous on the inner, surface, ·6 in. long; receptacles pedunculate, in pairs or solitary, axillary, 1 inch and upwards in diam., sub-globose, with conical umbonate apex and broad concave base, the sides rough, minutely tuberculate and deciduously hispid-pubescent or tomentose; the umbilicus minute, closed by stiff yellow hairs, and surrounded at some distance by a wavy annulus; basal bracts none; diameter, 1·25 in.; peduncles stout, clothed, like the receptacles, with deciduous tomentum, ·3 in. long; male flowers pedicillate, large, occupying the upper half of the receptacles with the gall flowers; stamens 2, anthers linear, apiculate; perianth of 4 pieces, of which 2 are as long as and 2 are shorter than the stamens: gall flowers smaller, and on shorter pedicels, than the males, the perianth of 4 distinct pieces, the achene globular; style terminal, stigma slightly dilated: fertile female flowers not known.

New Guinea; Beccari, (P. P. No. 937); H. O. Forbes, No. 830. Named after Signor Odoardo Beccari, of Florence, the distinguished Malayan Explorer and Botanist.

Ficus rhizophoraephylla, King: scandent, all parts glabrous, the leaves thinly coriaceous, on long petioles, narrowly elliptic, tapering equally to either end, the edges entire cartilaginous and slightly recurved when dry, the midrib keeled and very prominent on the under surface; primary lateral nerves 12 pairs or upwards, sub-horizontal, scarcely visible on either surface; under surface minutely tesselate, dull; upper surface very smooth, shining; length of blade 3·5 in, breadth 1·5 in.; petiole 1·3 to 1·8 in. long: stipules linear-lanceolate, glabrous, as long as, or longer than, the petioles; receptacles crowded near the apices of the branches, in pairs, shortly pedicillate, globular, very minutely tuberculate, ·25 in. in diam.; female flowers on strong cartilaginous prismatic peduncles thicker than the prismatico-conical smooth ovaries; style from the base of the ovary which it slightly exceeds in length, straight, erect; perianth of 3 linear pieces which rise from the margin of the peduncle: male and gall flowers unknown.

New Guinea: H. O. Forbes, No. 578.

Without having seen its male and gall flowers, I put this species without hesitation into the section *Eusyce*, on account of its resemblance to *F. oleaefolia*, King, a species from Sumatra which has leaves very like this in texture and venation, but is smaller in all its parts and especially in its stipules. A farther indication of affinity is found in the fact that the gall flowers of *oleaefolia* and the fertile females of this species have similar prismatic ovaries. This in foliage also resembles the Australian *F. eugenioides*, Mull., which however, has very different female flowers, and which moreover is monocious and falls into the section *Urostigma*. The leaves of this are of a pale greenish yellow when dry; in shape and venation they much resemble those of *Rhizophora conjugata*, Linn.

Ficus pauper, King, Monogr. Indo-Mal. and Chinese *Ficus;* leaves membranous, petiolate, slightly inequilateral, lanceolate or ovate-lanceolate, the apex acute, the edges entire, narrowed from below the midrib to the obscurely 3-nerved base; lateral primary nerves about 6 to 8 pairs diverging from the midrib at rather a wide angle and, like the midrib, prominent beneath; midrib with a few scattered adpressed hairs; upper surface glabrous; length of blade 1·5 in. to 2 inches; petiole ·3 in. long, adpressed-strigose beneath; stipules persistent, scarious, deciduously sericeous, ovate-acuminate, ·35 in. long; receptacles pedunculate, in pairs, axillary when young, globose, slightly constricted at the base, sparsely strigose, the umbilicus large and prominent; basal bracts 3, broadly ovate, blunt, puberulous; peduncle ·1 in. long, densely puberulous; ripe receptacles unknown; male flowers with 2 nearly sessile anthers and a perianth of three distinct pieces; gall flowers with sub-globular smooth ovary, short thick lateral style and truncate stigma; female flowers unknown.

New Guinea; Fly River, No. 49, D'Albertis. This is apparently a shrub or small tree. It approaches *F. erecta*, Thunbg.; but is distinguished from that species by its smaller leaves which have more numerous and more horizontal primary lateral nerves than those of *erecta;* and by its adpressed strigose much smaller receptacles.

Ficus soronensis, King, Monogr. Indo-Mal. and Chinese *Ficus;* young parts puberulous; leaves narrowly elliptic, tapering to either end, the apex shortly acuminate; the base acute, 3-nerved; the edges entire; primary lateral nerves 3 or 4 pairs, not very prominent; under surface sub-scabrid from numerous minute black tubercles, the reticulations open and rather distinct; length of blade 2 to 4 inches; petioles ·3 in. long; stipules lanceolate, scarious, puberulous, ·4 in. long, persistent; receptacles in pairs from the axils of the leaves or of scars of fallen leaves, pedunculate, globular, sub-scabrid, minutely tuberculate, the umbilicus prominent; basal bracts none, but a few verruciform bracts on the sides of the receptacle; peduncles with one or two bracteoles, ·15 in. long; female florets sessile or pedicillate, perianth of 3 or 4 pieces; achene sub-trigonous, slightly hairy near the apex, style lateral, stigma cylindric truncate; male and gall flowers not seen.

New Guinea, Soron, Beccari's Herb, P. P. No. 458. This comes near some of the forms of *F. erecta*, Thunbg., but differs in having the under surface of the leaves more tuberculate and much smaller receptacles. It is not, however, far removed from *erecta.*

XXI.—*Description of a new Species of Phytophagous Coleoptera alleged to be destructive to the Dhan Crops in the Chittagong District.—By* JOSEPH S. BALY. *Communicated by the* NATURAL HISTORY SECRETARY.

[Received Feb. 24th ;—Read March 2nd, 1887.]

HISPA AENESCENS.

Subelongata, nitida, subtus cum antennis nigra, pedibus nigro-aeneo micantibus ; supra nigro-aeneo aut nigro-cuprea ; thorace rugoso-punctato, lateribus ante medium spinis quatuor, basi connatis, et pone medium spinâ unicâ armatis ; elytris anguste oblongis, fortiter seriato-punctatis, spinis validis triseriatim dispositis, instructis Long. 2 lin.

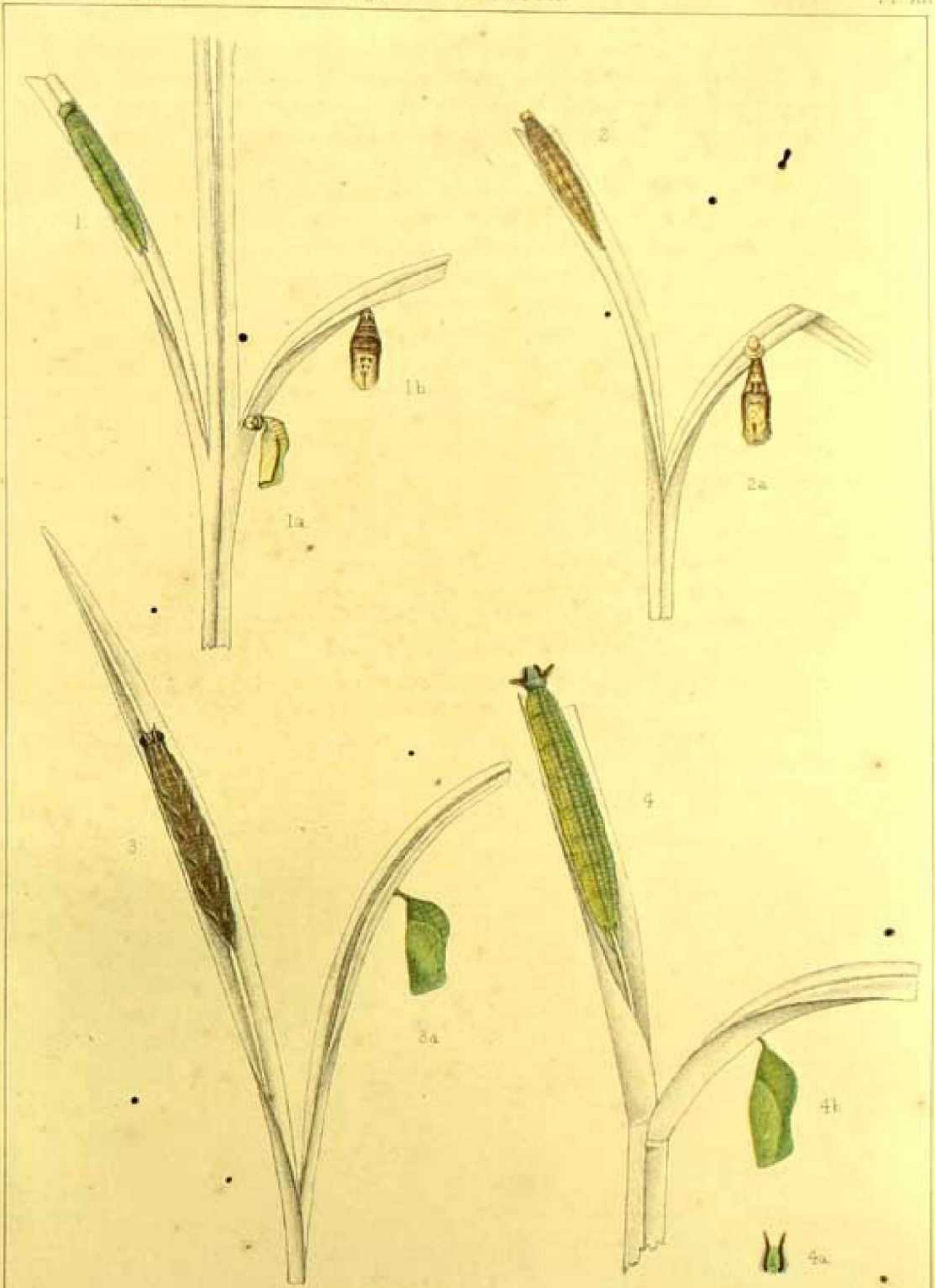
HAB. Chittagong District.

Antennæ slender, very slightly thickened towards the apex, the basal joint armed at its apex beneath with a short tooth ; vertex finely rugulose, longitudinally sulcate. Thorax rather broader than long, subcylindrical, flattened on the disk ; sides armed before the middle with four stout spines, united into a single stem at their base, the anterior spine looking almost directly upwards, the three others obliquely upwards and outwards, behind the middle is also a single spine looking outwards and slightly upwards, hinder angle armed with a short subacute tooth ; disk coarsely rugose-punctate, a longitudinal vitta and a slightly concave space on either side behind the middle nearly free from punctures. Scutellum smooth, impunctate. Elytra narrowly oblong, strongly seriate-punctate, armed with a number of strong erect spines, arranged in three longitudinal rows, those on the outer row more crowded than those on the disk. Legs simple.

The small tooth at the lower edge of the apex of the basal joints of the antennæ, and the absence of any spines on the upper surface of the joints, together with the colour of the upper surface of the body, will separate the above species from any others known to me.

L. DE NICÉVILLE, Journ. Asiat. Soc. Bengal. 1886 Vol. LV. Pt. II

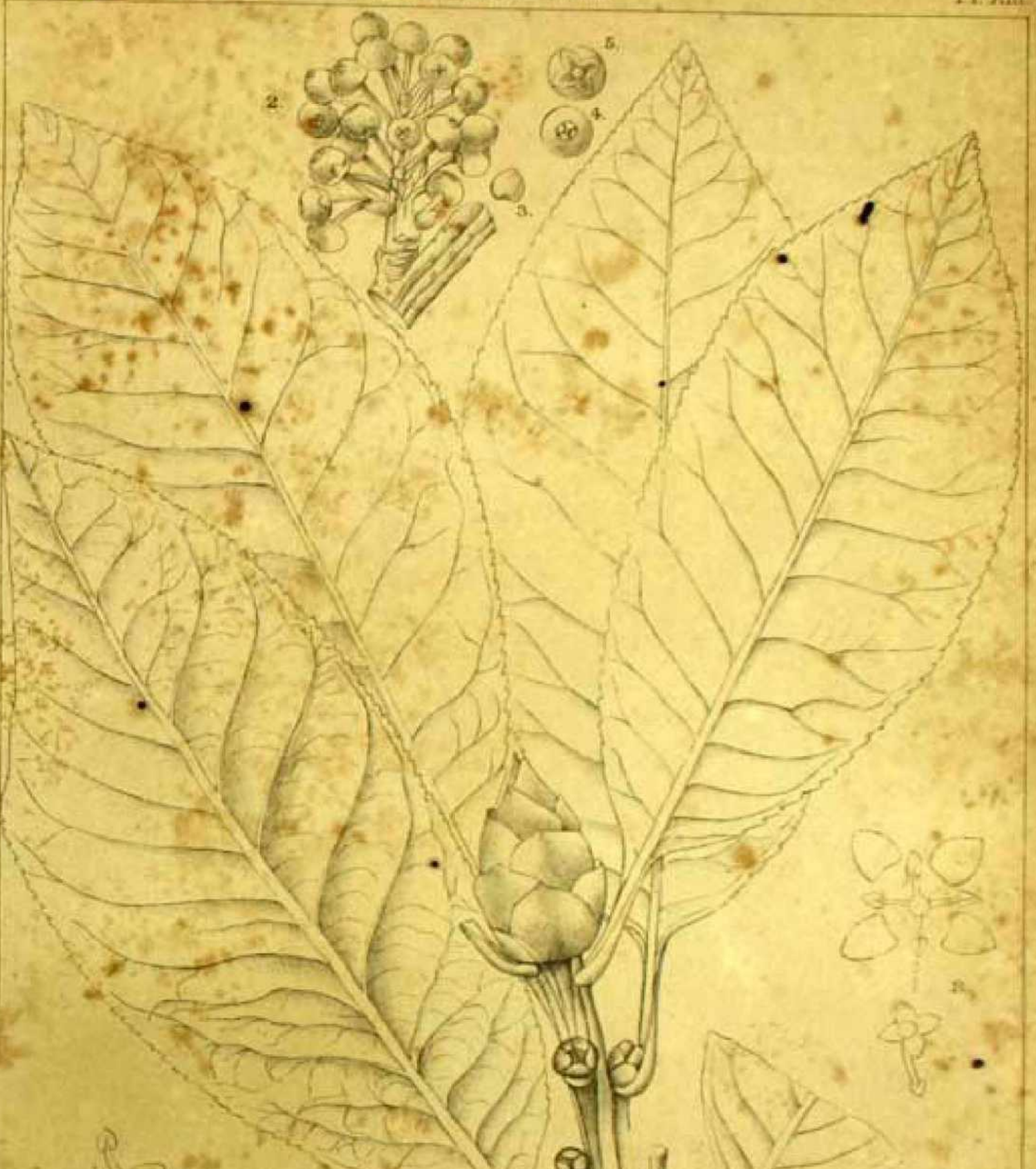
Pl. XII



Parker & Coward lith.

Mintern Bros. imp.

G. KING Journ. Asiat. Soc. Bengal. 1886. Vol. LV, Pt. II.



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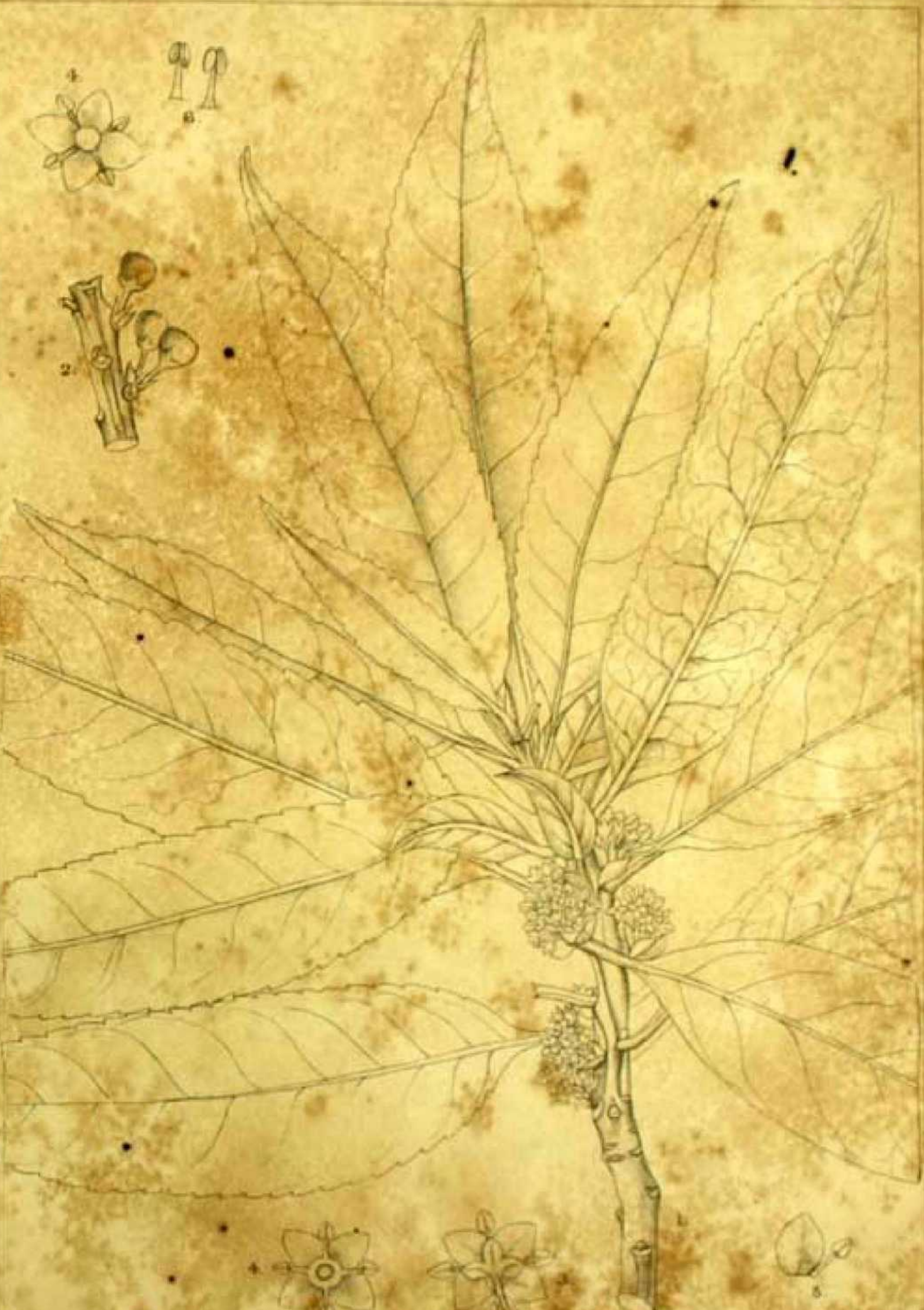
West, Newman & Co imp.

ILEX SIKKIMENSIS, King.

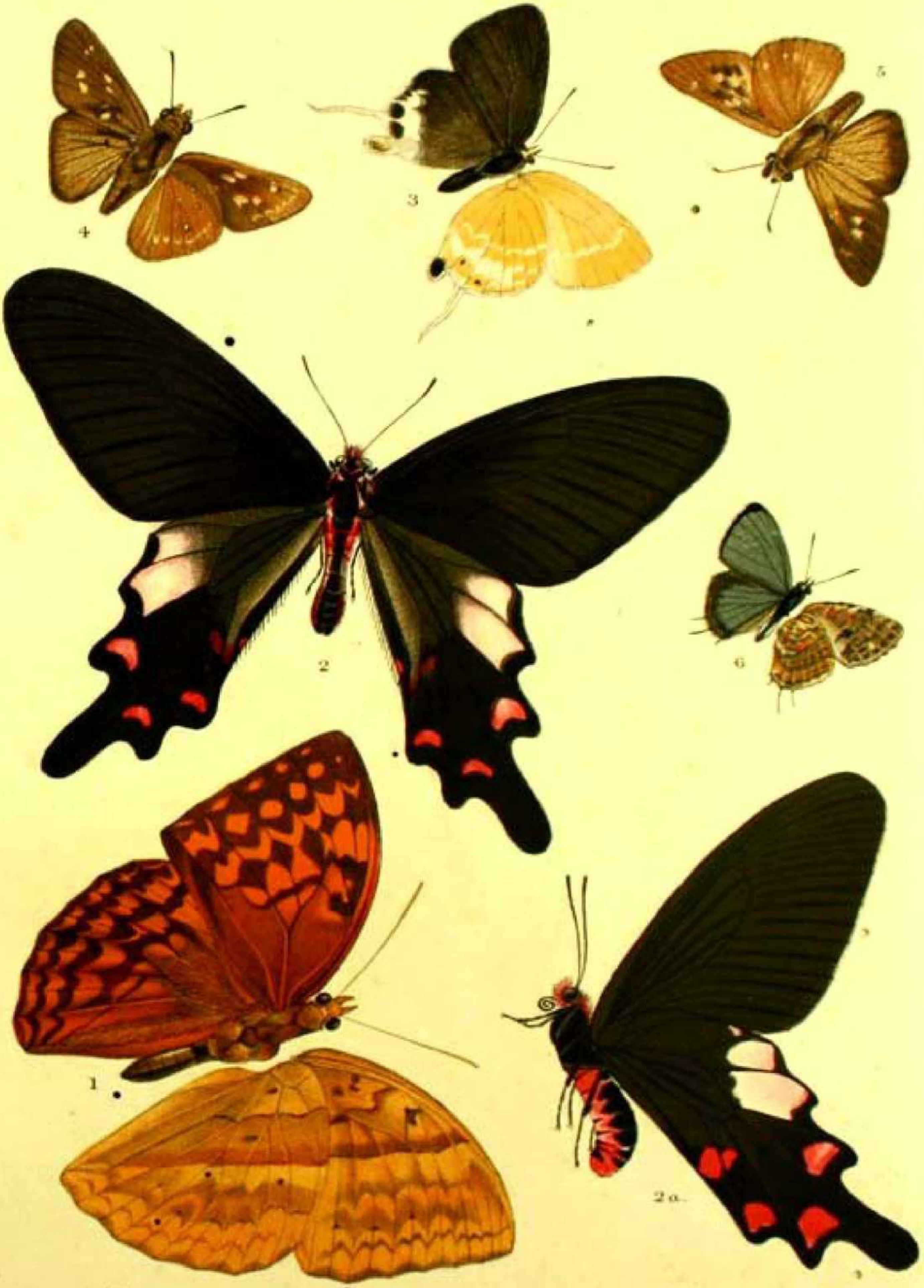


Parker & Coward lith.
West, Newman & Co. imp.

ILEX HOOKERI, King.

WOOD-MASON & DE NICEVILLE, Journ. As. Soc. Bengal, 1886, Vol LV Pt. II.

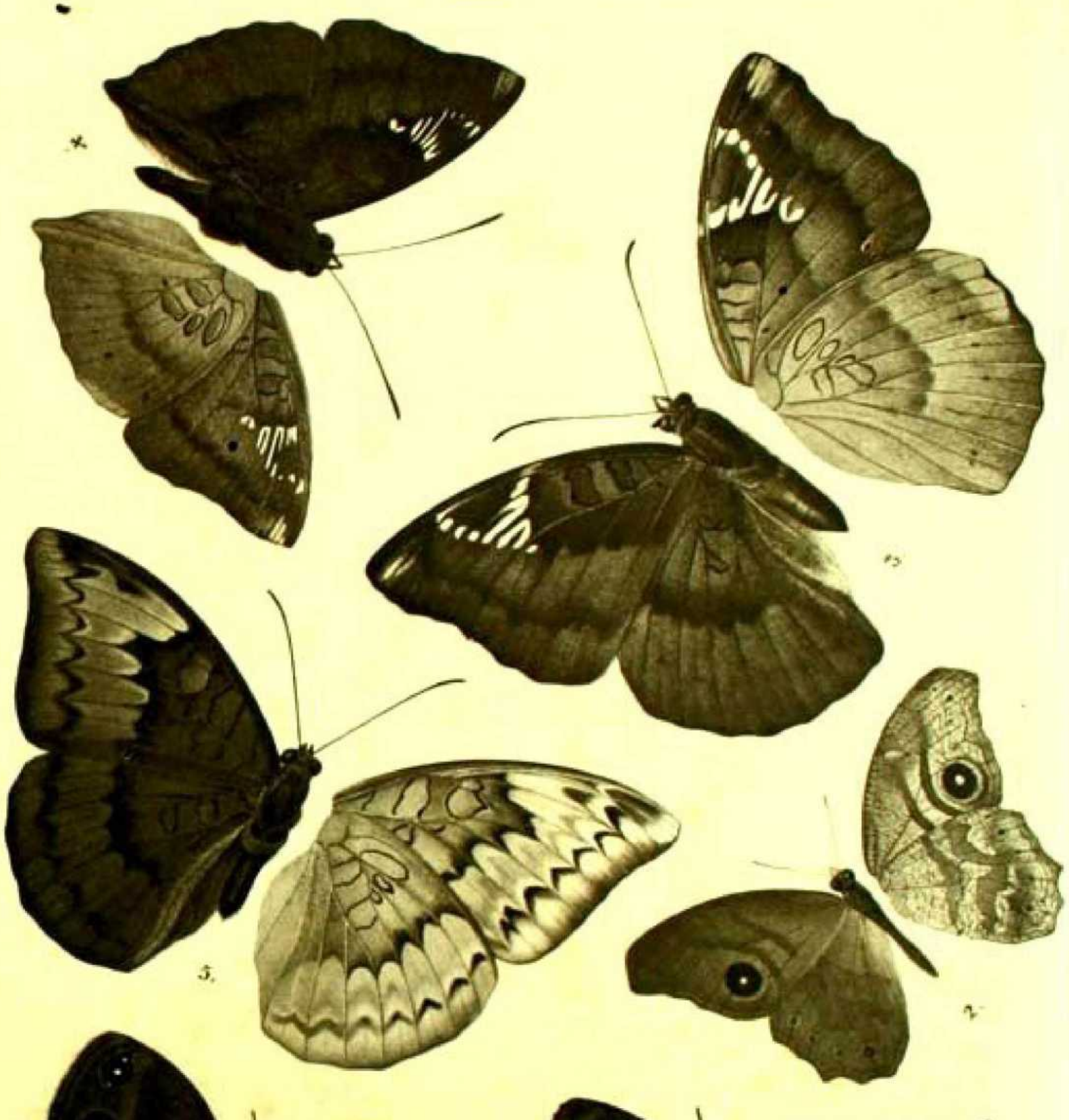
Pl. XV.



B. L. Dás del.
West, Newman & Co. chr. lith.

CACHAR BUTTERFLIES.

WOOD-MASON & DE NICEVILLE, Journ. Soc. Bengal, 1886, Vol. LV, Pt. II Pl. XV



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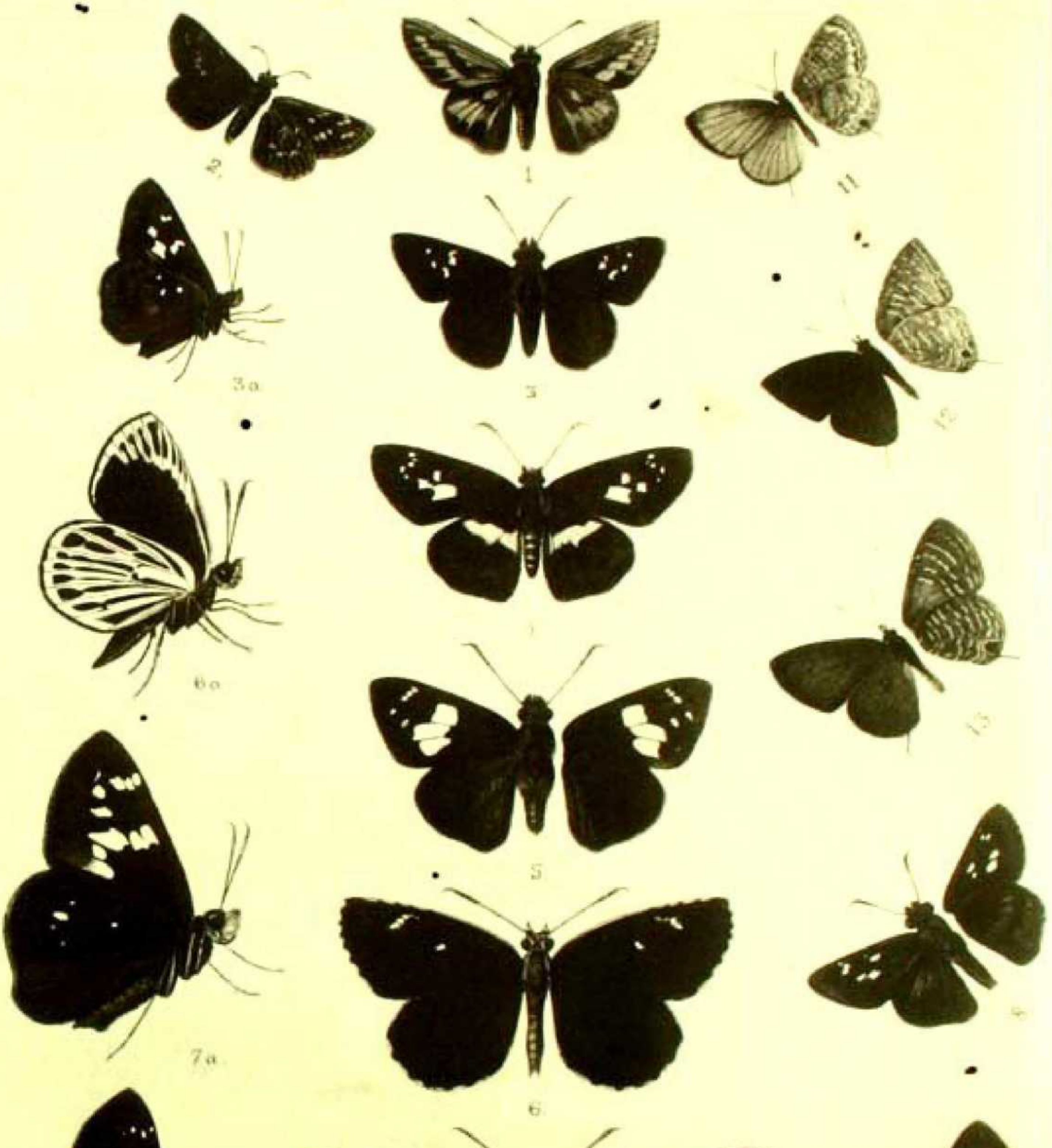
CACHAR BUTTERFLIES.

WOOD MASON & DE NICEVILLE, Journ at Soc Bengal 1886, Vol LV, Pt II Pl.XVI



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CACHAR BUTTERFLIES.

JOURNAL

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ASIATIC SOCIETY OF BENGAL.

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Part II.—NATURAL SCIENCE.

No. V.—1886.

XXII.—*List of the Lepidopterous Insects collected in Tavoy and in Siam during* 1884-85 *by the Indian Museum Collector under* C. E. PITMAN, ESQ., C. I. E., *Chief Superintendent of Telegraphs.* Part II. Rhopalocera.—*By* H. J. ELWES, F. Z. S., *and* LIONEL DE NICÉVILLE, F. E. S.

[Received September 11th;—Read November 3rd, 1886.]

(With Plate XX.)

The collection described in the following pages was sent in the autumn of 1885 by Mr. Wood-Mason, Superintendent of the Indian Museum, Calcutta, to Mr. H. J. Elwes to be worked out. On the latter returning a complete set of the species to the museum, Mr. de Nicéville compared it with the collections in that institution and completed the paper. The specimens were obtained by the Museum Collector, Moti Ram, between October, 1884, and June, 1885, at the following places:—

I. Tavoy, where the majority of the species were taken in the month of March,

II. Ponsekai,

III. Hills on the Siamese frontier.

IV. A few specimens were afterwards collected by Mr. James Wallace, Executive Engineer, Public Works Department, from near Sinbyoodine.

In determining the nomenclature of Lepidoptera from the Indian region, great difficulties are met with, because no one has hitherto compared a large series of the forms of wide-ranging dominant genera which inhabit almost every part of it, and which have hitherto been determined for the most part by entomologists whose views as to the limits of variation are at variance with our own, and, as we venture to think, with those of most modern entomologists. And as, moreover, the descriptions of most of these forms are not comparative, they cannot be understood in many cases by those who have not seen the types of the species described. Therefore we believe any identification of variable or wide-ranging Indian forms must be provisional, and that no fixed nomenclature can be expected until the Indian Lepidoptera have been worked out by a naturalist of great experience and philosophic mind, and who will bring to bear on the subject the same industry, care, and ability which have been shown by Dr. Staudinger in his Catalogue of European Lepidoptera, and by Messrs. Salvin and Godman in their model work "Biologia Centrali-Americana."

Mr. Distant's "Rhopalocera Malayana" gives a fairly complete and carefully worked out account of the butterflies of the Malay Peninsula, to which the present collection bears considerable resemblance, but the butterflies of Tenasserim seem, like the birds, to have a greater number of species with Indian than with Malayan affinities.

The only previous list of Tenasserim butterflies is that published by Mr. F. Moore in the Proceedings of the Zoological Society of London for 1878, p. 821, which contains 157 species, collected by Moti Râm under Mr. Ossian Limborg on and around the Moulayet range of mountains. Captain C. T. Bingham, however, has added very largely to our knowledge of this fauna, and Major C. H. E. Adamson's collection would no doubt if added extend the number of known species to at least double as many as we have here enumerated.

A large majority of the species in this collection are represented by one sex only, and by others by one or more imperfect specimens.

We have enumerated the species represented in Mr. Moore's list, but not found in this collection, and where necessary have placed them in their more modern genera, and we have also retained the order (as far as possible) of the sequence of the species given therein for the sake of convenience of reference, but have not numbered them. All those in both collections are marked with a star.

Family NYMPHALIDÆ.

Subfamily DANAINÆ.

*1. DANAIS (*Tirumala*) SEPTENTRIONIS.

D. septentrionis, Butler, Ent. Month. Mag., vol. xi, p. 163 (1874).

Numerous specimens from Tavoy, Ponsekai, and the hills.

*2. DANAIS (*Parantica*) MELANOÏDES.

Parantica melanoides, Moore, Proc. Zool. Soc. Lond., 1883, p. 247, n. 1.

Danais aglea, Moore (*nec* Cramer), Proc. Zool. Soc. Lond., 1878, p. 822.

A few males from Tavoy, Ponsekai, and the hills.

DANAIS (*Radena*) VULGARIS, Butler.

3. DANAIS (*Bahora*) CROCEA.

D. crocea, Butler, Proc. Zool. Soc. Lond., 1866, p. 57, p. 53, pl. iv, fig. 5.

Two males from Tavoy.

*4. DANAIS (*Caduga*) MELANEUS.

Papilio melaneus, Cramer, Pap. Ex., vol. i, pl. xxx, fig. D (1775).

Three males from Ponsekai.

DANAIS (*Caduga*) TYTIA, Gray.

*5. DANAIS (*Salatura*) GENUTIA.

Papilio genutia, Cramer, Pap. Ex., vol. iii, pl. ccvi, figs. C, D, *male* (1779).

Danais plexippus, Moore (*nec* Linnæus), Proc. Zool. Soc. Lond., 1878, p. 822.

Two specimens from Tavoy.

DANAIS (*Limnas*) CHRYSIPPUS, Linnæus.

*6. EUPLŒA (*Danisepa*) DIOCLETIANUS.

Papilio diocletianus, Fabricius, Ent. Syst., vol. iii, pt. 1, p. 40, n. 118 (1793).

Salpinx rhadamanthus, Moore (*nec* Fabricius), Proc. Zool. Soc. Lond., 1878, p. 822.

Two males from Tavoy.

*7. EUPLŒA (*Pademma*) ERICHSONII.

E. erichsonii, Felder, Reise Novara, Lep., vol. ii, p. 324, n. 444 (1865).

Salpinx crassa, Moore (*nec* Butler), Proc. Zool. Soc. Lond., 1878, p. 822.

A single male from Tavoy which does not quite agree with Mr. Moore's diagnosis of this species (Proc. Zool. Soc. Lond., 1883, p. 307, n. 11), as the third, fourth, and fifth upper submarginal spots on the upperside of the forewing are quite separate from, instead of being slightly confluent with, their opposite marginal spots. Mr. Moore in the above cited paper gives *E. crassa* from Siam and Cochin China only; he gives *E. erichsonii* from Moulmein only, *E. pembertoni* from Magaree, Pegu, *E. apicalis* from British Burma, *E. burmeisteri* from Upper Tenasserim, and *E. masoni* from Tenasserim—all these species coming into his genus *Pademma*. He seems to have lost sight of the specimens he gave in his Upper Tenasserim paper under the name of *Salpinx crassa* from "Ahsown; Moulmein to Meetan; Hatsiega; Naththoung to Paboga; Taoo, 3,000—5,000 feet," unless he has distributed them amongst the numerous species above-mentioned, all of which are from the region dealt with in this paper. There can be no doubt whatever that a very large proportion of the new species and some of the older ones given by Mr. Moore in his paper on *Euplœina* will have to disappear; in the collection of the Indian Museum, Calcutta, alone there are certainly dozens of specimens of *Euplœa* which do not agree with any of Mr. Moore's descriptions, and from his point of view constitute undescribed and therefore new species, but from ours are variations only.

EUPLŒA (*Pademma*) MASONI, Moore.

EUPLŒA (*Isamia*) MARGARITA, Butler.

*8. EUPLŒA (*Trepsichrois*) LINNÆI.

T. linnæi, Moore, Proc. Zool. Soc. Lond., 1883, p. 286, n. 1, pls. xxix, fig. 4, emale; xxx, fig. 1, male.

T. midamus, Moore (*nec* Linnæus), Proc. Zool. Soc. Lond., 1878, p. 823.

Several males from Tavoy, and the hills.

EUPLŒA (*Menama*) CUPREIPENNIS, Moore.

9. EUPLŒA (*Menama*) TAVOYANA.

M. tavoyana, Moore, Proc. Zool. Soc. Lond., 1883, p. 265, n. 4, pl. xxx, fig. 6, *male*.

Several males and one female which vary considerably *inter se*, but more or less agree with the type of this species (compared by Mr. Elwes) in the British Museum.

10. EUPLŒA (*Menama*) CAMARALZEMAN ?

E. camaralzeman, Butler, Proc. Zool. Soc. Lond., 1866, p. 271, n. 6, pl. xxix, fig. 1, *male*.

A male specimen from Tavoy seems to agree with the plate of this fine species from Siam, but is smaller, and wants the white dot on the upperside of the forewing in the second median interspace.

*11. EUPLŒA (*Penoa*) LIMBORGII.

E. limborgii, Moore, Proc. Zool. Soc. Lond., 1878, p. 823, pl. li, fig. 2, *male*.

Two males from Tavoy. We are inclined to believe that this species must be the same as *E. pinwilli*, Butler, from Province Wellesley, Malacca, and Sumatra. No characters by which to distinguish them are given by Mr. Moore, and though both are figured twice, we can detect no differences of specific value between them. If they are one species, as seems most probable, Mr. Butler's name has priority.

EUPLŒA (*Penoa*) ALCATHOË, Godart.

EUPLŒA (*Mahintha*) SUBDITA, Moore.

*12. EUPLŒA (*Crastia*) GODARTII.

E. godartii, Lucas, Rev. Zool., second series, vol. v, p. 319 (1853).

Several males from Tavoy, and the hills.

*13. EUPLŒA (*Stictoplæa*) HARRISII.

E. harrisii, Felder, Reise Novara, Lep., vol. ii, p. 328, n. 451 (1865), *male* only.

E. grotei (*female* only), Felder, l. c., p. 339, n. 470, pl. xli, fig. 7, *female*.
Stictoplœa grotei (*nec* Felder), Moore, Proc. Zool. Soc. Lond., 1878, p. 824.

Several males and one female from Tavoy and Sinbyoodine.

Subfamily SATYRINÆ.

LETHE MINERVA, Fabricius.
L. arcadia, Moore, Proc. Zool. Soc. Lond., 1878, p. 824.

LETHE MEKARA, Moore.

*14. LETHE ROHRIA.
Papilio rohria, Fabricius, Mant. Ins., vol. ii, p. 45, n. 445 (1787).

A single male from Ponsekai.

LETHE VERMA, Kollar.

15. LETHE EUROPA.
Papilio europa, Fabricius, Syst. Ent., p. 500, n. 247 (1775).

A few specimens of both sexes from Tavoy.

*16. MELANITIS LEDA, Linnæus.
Papilio leda, Linnæus, Syst. Nat., ed. xii, vol. i, pt. 2, p. 773, n. 151 (1767).
P. ismene, Cramer, Pap. Ex., vol. i, pl. xxvi, figs. A, B (1775).
Melanitis ismene, Moore, Proc. Zool. Soc. Lond., 1878, p. 824.
M. determinata, Butler, Ent. Month. Mag., vol. xxi, p. 246 (1885).

Several specimens of both sexes of the winter and dry-season forms of this species from Tavoy. As neither Limborg nor Moti Ram collected in this region during the rains, the ocellated form (true *M. leda*) was not obtained.

*17. MELANITIS BELA.
M. bela, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 223, n. 465 (1857).

Several males from Tavoy.

18. MELANITIS ZITENIUS.
Papilio zitenius, Herbst, Pap., pl. clxxxii, figs. 1, 2 (1796).
Melanitis zitenius, Distant, Rhop. Malay., p. 412, n. 3, pl. xxxviii, fig. 2, *male* (1886).

One female from Sinbyoodine of the dry-season form of the species which has been figured by Mr. Distant.

ZETHERA DIADEMOÏDES, Moore.

*19. MYCALESIS (*Calysisme*) MINEUS.
Papilio mineus, Linnæus, Syst. Nat., ed. xii, vol. i, pt. 2, p. 768, n. 126 (1767).
Mycalesis mineus, Moore, Proc. Zool. Soc. Lond., 1878, p. 825.
Calysisme indistans, Moore, Trans. Ent. Soc. Lond., 1880, p. 164.

Both sexes of the winter and dry-season form of the species from Tavoy. Limborg appears to have obtained the rains generation (true *M.*

mineus) also. It has nothing to do with the following, Mr. de Nicéville has lately bred the latter; it differs widely in the larval stage from *M. mineus*.

MYCALESIS (*Calysisme*) PERSEUS, Fabricius.

Papilio perseus, Fabricius, Syst. Ent., p. 488, n. 199 (1775).
Mycalesis perseus, Moore, Proc. Zool. Soc. Lond., 1878, p. 825.
Papilio blasius, Fabricius, Ent. Syst., Suppl., p. 426, n. 488-9 (1798).
Mycalesis blasius, Moore, Proc. Zool. Soc. Lond., 1878, p. 825.

Mr. de Nicéville having bred *ab ovo* these two hitherto supposed distinct species the one from the other, the former representing the dry-season, and the latter the wet-season form, we have placed them together under the older name, they were kept separate by Mr. Moore in his Tenasserim paper.

*20. MYCALESIS ANAXIOÏDES.

M. anaxioides, Marshall, Butt. of India, vol. i, p. 107, n. 87 (1883).
? *M. anaxias*, Moore, Proc. Zool. Soc. Lond., 1878, p. 825.

A single male from Tavoy of this very distinct species.

*21. MYCALESIS (*Orsotriœna*) RUNEKA.

M. runeka, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 234, n. 501 (1857).

Both sexes from Tavoy. The rains generation of this species is probably *M. medus*, Fabricius, and was not obtained.

*22. MYCALESIS (*Culapa*) MNASICLES.

M. mnasicles, Hewitson, Ex. Butt., vol. iii, *Mycalesis* pl. v, figs. 32, 33, *male* (1864).

One male from Tavoy rather smaller than Sumatran specimens in the British Museum compared by Mr. Elwes.

23. MYCALESIS (*Loesa*) FERVIDA.

Loesa fervida, Butler, Ann. and Mag. of Nat. Hist., fifth series, vol. x, p. 372, n. 1 (1882).
Mycalesis surkha, Marshall, Journ. A. S. B., vol. li, pt. 2, p. 37, n. 1, pl. iv, fig. 1, *male* (1882).

Three males from Tavoy and one from Ponsekai which agree with the types of this species in the British Museum, and Indian Museum, Calcutta.

YPTHIMA PHILOMELA, Johanssen.

Yphthima baldus, Moore, Proc. Zool. Soc. Lond., 1878, p. 825.

YPTHIMA METHORA.

Yphthima methora, Moore (*nec* Hewitson), Proc. Zool. Soc. Lond., 1878, p. 825.

The two above-mentioned species are probably different generations of the ubiquitous *Y. philomela*. The true *Y. methora* is a very distinct species, the male without a sexual mark, and occurs in Sikkim and Bhutan sparingly.

ERITES ANGULARIS, Moore.

Subfamily ELYMNIINÆ.

*24. ELYMNIAS UNDULARIS.

Papilio undularis, Drury, Ill. Ex. Ins., vol. ii, pl. x, figs. 1, 2, *male* (1773).
Elymnias tinctoria, Moore, Proc. Zool. Soc. Lond., 1878, p. 826.

Several males and one or two females from Tavoy which vary considerably. They do not agree with Mr. Moore's description of *E. tinctoria*, and we do not think that the latter can be separated from *E. undularis*. The females have the disc of the hindwing white; even in Burma, however, this feature is not constant.

ELYMNIAS LEUCOCYMA, Godart.

Dyctis leucocyma, Moore, Proc. Zool. Soc. Lond., 1878, p. 826.

DYCTIS VASUDEVA, Moore.

Elymnias vasudeva, Moore, Proc. Zool. Soc. Lond., 1878, p. 826.

Subfamily MORPHINÆ.

AMATHUSIA PHIDIPPUS, Linnæus.

ZEUXIDIA MASONI, Moore.

*25. DISCOPHORA TULLIA.

Papilio tullia, Cramer, Pap. Ex., vol. i, pl. lxxxi, figs. A, B, *female* (1775).

One or two males from Tavoy.

DISCOPHORA ZAL, Westwood.

*26. DISCOPHORA NECHO.

D. necho, Felder, Reise Novara, Lep., vol. iii, p. 462, n. 782 (1867).

One male from Tavoy.

*27. CLEROME ARCESILAUS.

Papilio arcesilaus, Fabricius, Mant. Ins., vol. ii, p. 28, n. 305 (1787).

A few males from Tavoy and Ponsekai.

ÆMONA LENA, Atkinson.

*28. XANTHOTÆNIA BUSIRIS.

X. busiris, Westwood, Trans. Ent. Soc. Lond., new series, vol. iv, p. 187, n. 6 (1858).

A few males from Tavoy and Ponsekai.

STICHOPHTHALMA LOUISA, Wood-Mason.

Thaumantis louisa, Moore, Proc. Zool. Soc. Lond., 1878, p. 827.

Subfamily NYMPHALINÆ.

*29. CIRRHOCHROA SURYA.

Cirrochroa surya, Moore, Proc. Zool. Soc. Lond., 1878, p. 827.

Two or three males from Tavoy.

*30. CUPHA ERYMANTHIS.

Papilio erymanthis, Drury, Ill. Ex. Ins., vol. i, pl. xv, figs. 3, 4 (1770).

Messaras erymanthis, Moore, Proc. Zool. Soc. Lond., 1878, p. 827.

One specimen from Ponsekai.

*31. ATELLA SINHA.

Terinos sinha, Kollar in Hügel's Kaschmir, vol. iv, pt. 2, p. 438, n. 1 (1848)

One male from Ponsekai.

32. ATELLA ALCIPPE.

Papilio alcippe, Cramer, Pap. Ex., vol. iv, pl. ccclxxxix, figs. G, H (1782).

Two males from Tavoy and one from Sinbyoodine.

33. ATELLA PHALANTA.

Papilio phalanta, Drury, Ill. Ex. Ins., vol. i, pl. xxi, figs. 1, 2 (1770).

A single male from Tavoy.

JUNONIA ATLITES, Linnæus.

J. laomedia, Moore, Proc. Zool. Soc. Lond., 1878, p. 828.

*34. JUNONIA LEMONIAS.

Papilio lemonias, Linnæus, Syst. Nat., ed. x, p. 473, n. 93 (1758).

A pair from Tavoy.

*35. JUNONIA ORITHYIA.

Papilio oritya, Linnæus, Mus. Ulr., p. 278, n. 96 (1764).

A few specimens of both sexes from Tavoy.

JUNONIA ALMANA, Linnæus.

36. JUNONIA HIERTA.

Papilio hierta, Fabricius, Ent. Syst., Suppl., p. 424, n. 281-2 (1798).

One pair from Tavoy.

*37. PRECIS IPHITA.

Papilio iphita, Cramer, Pap. Ex., vol. iii, pl. ccix, figs. C, D (1779).

Several specimens from Tavoy, and the hills.

38. PREUDERGOLIS WEDAH.

Ariadne wedah, Kollar in Hügel's Kaschmir, vol. iv, pt. 2, p. 437, n. 1 (1848).

Two or three males from Tavoy and Ponsekai.

39. ERGOLIS MERIONE.

Papilio merione, Cramer, Pap. Ex., vol. ii, pl. cxliv, figs. G, H (1777).

Several examples of both sexes from Tavoy and Ponsekai.

40. ERGOLIS ARIADNE.

Papilio ariadne, Linnæus, Syst. Nat., ed. xii, vol. i, pt. 2, p. 778, n. 170 (1767).

One male from Tavoy.

*41. DOLESCHALLIA PRATIPA.

D. pratipa, Felder, Wien. Ent. Monatsch., vol. iv, p. 399, n. 20 (1860).

Many examples from Tavoy and the hills, several of which are hardly separable from the North and South Indian, Ceylonese and Andamanese *D. polibete*, Cramer.

KALLIMA LIMBORGII, Moore.

*42. CYRESTIS THYODAMAS.

C. thyodamas, Boisduval, Cuvier's Règne Animal, Insectes vol. ii, pl. cxxxviii, fig. 4 (1836).

One male from Tavoy.

43. CYRESTIS NIVALIS.

C. nivalis, Felder, Reise Novara, Lep., vol. iii, p. 414, n. 634 (1867).

A single male from Tavoy.

*44. CYRESTIS COCLES.

Papilio cocles, Fabricius, Mant. Ins., vol. ii, p. 7, n. 53 (1787).

Cyrestis carli, Distant, Rhop. Malay., p. 141, n. 2, pl. xiii, fig. 5, *male* (1883).

A single male from Sinbyoodine which seems to agree very well with, though rather smaller than, this species figured by Mr. Distant under its varietal name *C. carli*.

45. CYRESTIS PERIANDER.

Papilio periander, Fabricius, Mant. Ins., vol. ii, p. 9, n. 74 (1787).

Cyrestis themire, Honrath, Berl. Ent. Zeitschr., vol. xxviii, pt. 2, p. 398, pl. x, fig. 5 (1884).

One male from Ponsekai agreeing with Mergui and Malacca examples.

CYRESTIS (*Chersonesia*) RISA, Doubleday and Hewitson.

46. SYMBRENTHIA HIPPOCLUS.

Papilio hippoclus, Cramer, Pap. Ex., vol. iii, p. 46, pl. ccxx, figs. C, D, *male* (1779).

A few males from Tavoy of this widely-spread species.

47. CYNTHIA EROTA,

Papilio erota, Fabricius, Ent. Syst., vol. iii, pt. i, p. 76, n. 237 (1793).

Several males from Tavoy, Ponsekai and Sinbyoodine.

*48. HERONA ANGUSTATA.

H. angustata, Moore, Proc. Zool. Soc. Lond., 1878, p. 829.

A pair from Tavoy. At best this species is only a local race of

H. marathus, Doubleday and Hewitson, and we do not yet know whether it is constantly distinct from the typical form.

PENTHEMA DARLISA, Moore.

*49. PARTHENOS GAMBRISIUS, var. LILACINUS.

Papilio gambrisius, Fabricius, Mant. Ins., vol. ii, p. 12, n. 113 (1787).

Parthenos lilacinus, Butler, Trans. Linn. Soc., Zoology, second series, vol. i, p. 544 (1877).

P. apicalis, Moore, Proc. Zool. Soc. Lond., 1878, p. 829.

Two males from Ponsekai of the varietal form *lilacinus*, showing no approach to the other varietal form *apicalis* described by Mr. Moore.

50. HYPOLIMNAS BOLINA.

Papilio bolina, Linnæus, Syst. Nat., ed. x, p. 479, n. 124 (1758).

A pair from Tavoy and Ponsekai.

51. YOMA VASUKI.

Y. vasuki, Doherty, Journ. A. S. B., vol. lv, pt. 2, p. 259, n. 9 (1886).

A single male from Sinbyoodine of this beautiful species.

52. RHINOPALPA POLYNICE.

Papilio polynice, Cramer, Pap. Ex., vol. iii, pl. cxcv, figs. D, E, *male* (1779).

One male from Tavoy. If *R. fulva*, Felder, is hereafter proved to be distinct from *R. polynice*, the species in question may be called by the former name.

53. CETHOSIA BIBLIS.

Papilio biblis, Drury, Ill. Ex. Ins., vol. i, pl. iv, fig. 2, *male* (1770).

One male from Ponsekai.

54. EURIPUS HALITHERSES.

E. halitherses, Doubleday and Hewitson, Gen. Diurn. Lep., vol. ii, p. 293, n. 1, pl. xli, fig. 2, *male* (1850).

Hestina isa, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 161, n. 333, *female* (1857).

Euripus euplœoides, Felder, Reise Novara, Lep., vol. iii, p. 415, n. 638 (1866); id., Distant, Rhop. Malay., p. 134, n. i, pl. xiii, fig. 6, *male*; 7, *female* (1883).

One female from Tavoy agrees perfectly with Distant's figure, and almost exactly with the commonest though extremely variable form of the female of this species occurring in Sikkim which Mr. Moore described as a distinct species under the name of *E. isa*. Mr. Distant, after devoting nearly a page to a description of this form, ends by saying that *E. euplaoides* is clearly a local race of *E. halitherses*, but we cannot allow this to be the case, as it is not peculiar to any one region or locality. A local race is a race which is limited in its range, whilst this seems to be merely an inconstant variety in the female sex.

55. ATHYMA PERIUS.

Papilio perius, Linnæus, Syst. Nat., ed. x, p. 471, n. 79 (1758).

A few males from Tavoy and Ponsekai.

56. ATHYMA ASURA.

A. asura, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. *i*, p. 171, n. 350, pl. *va*, fig. 1 (1857).

Two broken females from Tavoy agreeing with specimens from the N.-W. Himalayas (*Hocking*), and from Shanghai (*Pryer*), in Mr. Elwes, collection.

57. ATHYMA ZEROCA.

A. zeroca, Moore, Proc. Zool. Soc. Lond., 1872, p. 564.

Two males from Tavoy are rather smaller than Sikkim specimens.

58. ATHYMA SELENOPHORA.

Limenitis selenophora, Kollar in Hügel's Kaschmir, vol. iv, pt. 2, p. 426, pl. vii, figs. 1, 2, *male* (1848).

One male from Tavoy has the macular submarginal band on the upperside of the hindwing slightly more conspicuous than in Sikkim specimens.

59. ATHYMA ASITA.

A. asita, Moore, Proc. Zool. Soc. Lond., 1858, p. 13, n. 8.

A very typical male agreeing exactly with the description from Ponsekai, and two females from Tavoy.

60. ATHYMA MAHESA.

A. mahesa, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. *i*, p. 176, n. 360, pl. *va*, fig. 7 (1857).

Two males and one female from Tavoy are rather transitional to *A. ranga*, Moore, the latter probably being the dry-season form of *A. mahesa*.

61. ATHYMA PRAVARA.

A. pravara, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. *i*, p. 173, n. 354, pl. *va*, fig. 4 (1857).

One male from Ponsekai agrees with specimens from North-Eastern India, the Malay Peninsula, Sumatra, Java and Borneo.

62. ATHYMA KANWA.

A. kanwa, Moore, Proc. Zool. Soc. Lond., 1858, p. 17, n. 17, pl. li, fig. 2.

One female from Tavoy agrees with Bornean specimens, except that the bands on the hindwing are rather broader. It occurs also in the Naga Hills.

63. ATHYMA NIVIFERA.

A. nivifera, Butler, Trans. Linn. Soc., Zoology, second series, vol. i, p. 540, n. 5, pl. lxix, fig. 4, *male* (1877).

A male from Tavoy agrees with Malacca and Bornean examples in the British Museum. At best this species is but a "local race" of *A. nefte*, Cramer.

*64. LEBADEA ISMENE.

Limenitis ismene, Doubleday and Hewitson, Gen. Diurn. Lep., vol. ii, p. 276, n. 10, pl. xxxii, fig. 2 (1850).

Lebadea attenuata, Moore, Proc. Zool. Soc. Lond., 1878, p. 829.

One or two specimens from Ponsekai. Examples from this region and Tenasserim are typical *L. attenuata*, but they merge imperceptibly into *L. ismene*, Doubleday and Hewitson, in North-Eastern India.

65. LIMENITIS (*Moduza*) PROCRIS.

Papilio procris, Cramer, Pap. Ex., vol. ii, pl. cvi, figs. E, F (1777).

A few specimens from Tavoy.

66. APATURA NAMOUNA.

A. namouna, Doubleday, Ann. and Mag. of Nat. Hist., vol. xvi, p. 178 (1845).

A male from Tavoy is quite similar to Sikkim examples.

67. APATURA (*Rohana*) PARYSATIS.

A. parisatis, Westwood, Gen. Diurn. Lep., vol. ii, p. 305, n. 20, *note* (1850).

Two males from Ponsekai, and a pair from Tavoy.

*68. NEPTIS ADARA.

N. adara, Moore, Proc. Zool. Soc. Lond., 1878, p. 830.

One specimen from Ponsekai and two from Tavoy which agree with some from Burma named by Mr. Moore. It is very doubtfully distinct from *N. varmona*, Moore.

69. NEPTIS VARMONA.

N. varmona, Moore, Proc. Zool. Soc. Lond., 1872, p. 561.

Two from Tavoy and one from Ponsekai agree with some forms of this widely-spread and variable species.

NEPTIS MEETANA, Moore.

70. NEPTIS EMODES.

N. emodes, Moore, Proc. Zool. Soc. Lond., 1872, p. 561, pl. xxxii, fig, 2.

One female from Tavoy.

NEPTIS JUMBAH.

N. jumba, Moore, Proc. Zool. Soc. Lond., 1878, p. 830.

71. NEPTIS OPHIANA.

N. ophiana, Moore, Proc. Zool. Soc. Lond., 1872, p. 561.

One male from Ponsekai agrees with Sikkim examples in all but the rather yellower shade of the ground-colour on the underside.

NEPTIS ADIPALA, Moore.

72. NEPTIS SOMA.

N. soma, Moore, Proc. Zool. Soc. Lond., 1858, p. 9, n. 17, pl. xlix, fig. 6.

One specimen from Ponsekai agrees exactly with Eastern Himalayan specimens.

73. NEPTIS SUSRUTA ?

N. susruta, Moore, Proc. Zool. Soc. Lond., 1872, p. 563, pl. xxxii, fig. 4.

Two males from Tavoy. They agree fairly well with Upper Tenasserim specimens of this species in the Indian Museum, Calcutta, named by Mr. Moore, but have all the bands and spots of the upperside pure white not ferruginous (? fuliginous) white.

74. NEPTIS BATARA.

N. batara, Moore, Trans. Ent. Soc. Lond., 1881, p. 310.

One male specimen from Tavoy so named by Mr. Moore. The type was from Sumatra. It is very near to *N. miah*, Moore, but has the orange bands on the upperside broader throughout.

NEPTIS (*Rahinda*) PLAGIOSA, Moore.

75. NEPTIS (*Rahinda*) DORELIA.

N. dorelia, Butler, Trans. Linn. Soc., Zoology, second series, vol. i, p. 542, n. 7, pl. lxviii, fig. 3 (1877).

A single female from Tavoy so named by Mr. Moore. It has the second subcostal nervule of the forewing given off *after* the apical termination of the cell, but Mr. Distant places this species in the other section of the genus which contains the true *Neptes*. In the Indian Museum, Calcutta, are numerous specimens of a *Neptis* taken by Dr. Anderson in the Mergui Archipelago which Mr. Moore has also ticketed "*Neptis dorelia*." These latter have the second subcostal nervule of the forewing given off some distance *before* the apex of the cell. As there is much confusion regarding this species, we trust that some one will clear it up by referring to the type of *dorelia*, and stating whether it is a *Rahinda* or a *Neptis*. The Mergui specimens are we believe *N. sattanga*, Moore.

76. SYMPHÆDRA DIRTEA.

Papilio dirtea, Fabricius, Ent. Syst., vol. iii, pt. 1, p. 59, n. 184 (1793).

Three males and two females from Tavoy and Ponsekai. These specimens agree in some particulars with the *S. pardalis* of Moore, but as *S. dirtea* is an eminently variable species even in the same locality, the former species cannot in our opinion be retained even as a local race.

77. EUTHALIA (*Dophla*) DUNYA.

Adolias dunya, Doubleday and Hewitson, Gen. Diurn. Lep., vol. ii, p. 291, n. 6, pl. xliv, fig. 3 (1850).

A single male from Tavoy. It occurs also in Mergui, Perak, Sumatra, and Borneo, and seems to be very constant throughout its range.

EUTHALIA LEPIDEA, Butler.

Adolias lepidea, Moore, Proc. Zool. Soc. Lond., 1878, p. 830.

Mr. de Nicéville has lately discovered that the males of this and of the two following species and probably the whole of this group, have on the upperside of the hindwing bordered anteriorly by the costal nervure and extending into the subcostal interspace, an oval glandular patch of lustrous modified deep black scales, this being an unique feature in this group of the large genus *Euthalia*, and has not previously been recorded.

*78. EUTHALIA SATROPACES.

Adolias satropaçes, Hewitson, Ent. Month. Mag., vol. xiii, p. 150 (1876) ; id., Moore, Proc. Zool. Soc. Lond., 1878, p. 830.

There are four males from Tavoy.

79. EUTHALIA ANDERSONII.

E. andersonii, Moore, Journ. A. S. B., vol. liii, pt. 2, p. 18 (1884).

Two pairs from Tavoy,

EUTHALIA XIPHIONES, Butler.

Adolias xiphiones, Butler, Proc. Zool. Soc. Lond., 1868, p. 609, n. 60, pl. xlv, fig. 6, *male*.

A. parvata, Moore, Proc. Zool. Soc. Lond., 1878, p. 831, pl. lii, fig. 3, *female*.

EUTHALIA DISCISPILOTA, Moore.

Adolias discispilota, Moore, Proc. Zool. Soc. Lond., 1878, p. 831, pl. lii, fig. 2, *female*.

*80. EUTHALIA JAHNU.

Adolias jahnu, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 192, n. 387, *female* (1857) ; idem, id., Proc. Zool. Soc. Lond., 1878, p. 831.

A. sananda, Moore, Trans. Ent. Soc. Lond., new series, vol. v, p. 76, n. 30, pl. vii, fig. 3, *male* (1859).

A male from Tavoy agrees with Sikkim specimens.

EUTHALIA TAOOANA, Moore.

Adolias taooana, Moore, Proc. Zool. Soc. Lond., 1878, p. 831.

*81. CHARAXES (*Eulepis*) ATHAMAS.

Papilio athamas, Drury, Ill. Ex. Ins., vol. i, pl. ii, fig. 4 (1770).

Charaxes samatha, Moore, Proc. Zool. Soc. Lond., 1878, p. 831.

Several specimens from Ponsekai and Tavoy, which differ slightly *inter se* in the width of the discal band, some have it exactly as wide as in Drury's figure of *C. athamas*, others a little wider, none "one-third less in width" as given by Mr. Moore as distinctive of *C. samatha*.

82. CHARAXES (*Eulepis*) DELPHIS.

C. delphis, Doubleday, Ann. Soc. Ent. Fr., second series, vol. i, p. 217, pl. vii (1843) :

Two males of this fine species from Tavoy.

83. CHARAXES (*Eulepis*) EUDAMIPPUS.

E. eudamippus, Doubleday, Ann. Soc. Ent. Fr., second series, vol. i, p. 218, pl. viii (1843).

One male from Tavoy and one from Ponsekai.

CHARAXES (*Haridra*) MARMAX, Westwood.

CHARAXES (*Haridra*) DESA, Moore.

*84. CHARAXES (*Haridra*) AGNA.

C. agna, Moore, Proc. Zool. Soc. Lond., 1878, p. 832.

A single male from Tavoy agrees with the description of this species.

CHARAXES (*Haridra*) HARPAX, Felder.

85. CHARAXES (*Haridra*) CORAX.

C. corax, Felder, Reise Novara, Lep., vol. iii, p. 444, n. 724 (1867).

A few male specimens from Tavoy.

PROTHOË ANGELICA, Butler.

P. angelica, Butler, Ann. and Mag. of Nat. Hist., fifth series, vol. xvi, p. 53 (1885).

P. franckii, Moore (*nec* Godart), Proc. Zool. Soc. Lond., 1878, p. 832.

Family LEMONIIDÆ.

Subfamily LIBYTHÆINÆ.

LIBYTHEA MYRRHA, Godart.

Subfamily NEMEOBIINÆ.

ZEMEROS FLEGYAS, Cramer.

*86. TAXILA FASCIATA.

T. fasciata, Moore, Proc. Zool. Soc. Lond., 1878, p. 832, pl. lii, fig. 1, *male*.

One male and two females from Tavoy. The former differs from the same sex of a Javan specimen of *T. haquinus*, Fabricius, in the Indian Museum, Calcutta, in having a white instead of an orange subapical oblique fascia on the underside of the forewing, which shows through faintly on the upperside; it is also rather larger.

87. TAXILA THUISTO.

T. thuisto, Hewitson, Ex. Butt., vol. ii, *Taxila* pl. i, figs. 5, 6, *female* (1861).

Abisara thuisto, Distant, Rhop. Malay., p. 191, n. 4, woodcut n. 51, *male*; 52, *female* (1883).

A single male from Tavoy which nearly agrees with Distant's figure, but has the silvery spot of the submarginal series in the subcostal interspace on the underside of the forewing showing through on the upperside. It agrees with Bornean examples compared by Mr. Elwes, but the spots below are smaller and better defined.

ABISARA NEOPHRON, Hewitson.

*88. ABISARA ECHERIUS.

Papilio echerius, Stoll, Suppl. Cramer's Pap. Ex., vol. v, pl. xxxi, figs. 1, 1 A *male* ; 1 B, *female* (1790).

Abisara angulata, Moore, Proc. Zool. Soc. Lond., 1878, p. 833.

One pair from Tavoy agreeing closely with some specimens from Tenasserim, Tonghoo, Akyab, &c. We do not see how to distinguish between the numerous varieties of this wide-spread species which have been described by Moore under many names. These forms seem to vary too much in most localities to enable them to be distinguished even as local races.

Family LYCÆNIDÆ.

89. CURETIS MALAYICA ?

Anops malayica, Felder, Reise Novara, Lep., vol. ii, p. 221, n. 241, pl. xxviii, fig. 18, *male* (1865).

Curetis malayica, Distant, Rhop. Malay., p. 202, n. 1, pl. xxii, fig. 28, *male* (1884).

One male from Tavoy and four from Ponsekai agree more closely with the figure of this species than with any other, but differ from it on the upperside of the hindwing in the black margin being broader and inwardly diffused, not sharply defined, narrow, and even, as in Felder's figure. These specimens agree exactly with some from Sikkim, in which locality there appears to be every gradation between this species and the most highly angulated *C. bulis*.

90. CURETIS BULIS ?

Anops bulis, Doubleday and Hewitson, Gen. Diurn. Lep., vol. ii, p. 473, n. 3, pl. lxxv, fig. 5, *male* (1852) ; id., Hewitson, Ill. Diurn. Lep., p. 15, n. 2, pl. iv, fig. 1 (1863).

One female from Ponsekai which agrees in markings and colour with the two figures above quoted, but in the angulation of both wings is about intermediate between them.

91. CASTALIUS ROSIMON.

Papilio rosimon, Fabricius, Syst. Ent., p. 523, n. 341 (1775).

A single specimen from Tavoy.

*92. CASTALIUS ROXUS.

Polyommatus roxus, Godart, Enc. Méth., vol. ix, p. 659, n. 142 (1823).

Three examples from Ponsekai.

93. NACADUBA ARDATES.

Lycæna ardates, Moore, Proc. Zool. Soc. Lond., 1874, p. 574, pl. lxvii, fig. 1.

Two males from Tavoy.

LAMPIDES ALEXIS, Stoll.

In Mr. de Nicéville's opinion this is almost certainly the cold and dry-season generation of the following species.

*94. LAMPIDES ÆLIANUS.

Hesperia aelianus, Fabricius, Ent. Syst., vol. iii, pt. 1, p. 280, n. 79 (1793).

One female from Tavoy. This is probably the wet-season generation of *L. alexis*.

*95. LAMPIDES ELPIS.

Polyommatus elpis, Godart, Enc. Méth., vol. ix, p. 654, n. 125 (1823).

One pair from Tavoy.

*96. CATOCHRYSOPS STRABO.

Hesperia strabo, Fabricius, Ent. Syst., vol. iii, pt. 1, p. 287, n. 101 (1793).

Lampides kandarpa, Moore, Proc. Zool. Soc. Lond., 1878, p. 833.

One male from Ponsekai, and a female from Tavoy, of this wide-ranging species.

97. CATOCHRYSOPS LITHARGYRIA.

Lampides lithargyria, Moore, Ann. and Mag. of Nat. Hist., fourth series, vol. xx, p. 340 (1877).

One male from Tavoy. Is this really a distinct species from the preceding? It only differs in the shade of colour of the upperside, *C. strabo* being "lilac-blue," *C. lithargyria*, "greyish silvery-blue." The two always appear to occur together, and the female of the latter species is even now undescribed.

DRUPADIA LISIAS, Fabricius.

Hypolycæna lisias, Moore, Proc. Zool. Soc. Lond., 1878, p. 833.

It is probable that these specimens have been since described by Mr. Moore under the name of *D. boisduvalii.**

*98. CHERITRA FREJA.

Hesperia freja, Fabricius, Ent. Syst., vol. iii, pt. 1, p. 263, n. 19 (1793).

Myrina freja, Moore, Proc. Zool. Soc. Lond., 1878, p. 834.

Four pairs of this common species from Ponsekai and Tavoy.

99. CHERITRA ETOLUS.

Papilio etolus, Fabricius, Mant. Ins., vol. ii, p. 66, n. 620 (1787).

Two specimens from Ponsekai.

100. HYPOLYCÆNA ERYLUS.

Polyommatus erylus, Godart, Enc. Méth., vol. ix, p. 633, n. 60 (1823).

Two male specimens from Tavoy.

THAMALA MINIATA, Moore.

VADEBRA SUFFUSA, Moore.

Deudorix suffusa, Moore, Proc. Zool. Soc. Lond., 1878, p. 834, pl. lii, fig. 8.

*101. LOXURA ATYMNUS.

Papilio atymnus, Cramer, Pap. Ex., vol. iv, pl. cccxxxi, figs. D, E (1780).

A few specimens from Ponsekai and Tavoy.

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* Journ. A. S. B., vol. liii, pt. 2, p. 31 (1884).

102. PORITIA PHRAATICA.

P. phraatica, Hewitson, Ill. Diurn. Lep., p. 214, n. 2, pl. lxxxviii, fig. 2, *female* (1878).

A pair of this pretty species, so named by Mr. Moore, in bad condition from Ponsekai. The male does not at all agree with Distant's figure of this species. It seems near to *P. sumatræ*, Felder, but is quite distinct.

AMBLYPODIA TAOOANA, Moore.

NARATHURA MOOLAIANA, Moore.

*103. NILASERA CENTAURUS.

Papilio centaurus, Fabricius, Syst. Ent., p. 520, n. 329 (1775).
Amblypodia nakula, Felder, Wien. Ent. Monatsch., vol. iv, p. 395, n. 4 (1860).
Arhopala nakula, Moore, Proc. Zool. Soc. Lond., 1878, p. 835.

Three specimens from Tavoy and Ponsekai.

NILASERA VIHARA, Felder.

Arhopala vihara, Moore, Proc. Zool. Soc. Lond., 1878, p. 835.

104. SATADRA AGABA.

Amblypodia agaba, Hewitson, Cat. *Lyc.* B. M., p. 8, n. 39, pl. iv, figs. 39, 40, *female* (1862).

One male from Tavoy so named by Mr. Moore. The male is undescribed. It differs from the female only in being purple rather than bright blue on the upperside, the outer margins narrowly and evenly, instead of broadly, black. Underside like the female.

SURENDRA QUERCETORUM, Moore.

THADUCA MULTICAUDATA, Moore.

Family PAPILIONIDÆ.

Subfamily PIERINÆ.

*105. TERIAS HECABE.

Papilio hecabe, Linnæus, Syst. Nat., ed. x, p. 470, n. 74 (1758).

A few specimens from Tavoy, Ponsekai, and the hills, which, as usual in almost all localities, vary considerably; some of them might perhaps be called *T. sari*, another *T. hecabeoides*, another *T. uniformis* by those who believe in the minute subdivision of this genus which has been carried out by Messrs. Butler and Moore. But for our part we are quite unable to see how the majority of these species can be defined, and we think that, when the whole genus comes to be critically revised by the light of modern ideas, instead of twenty or thirty, not more than five or six species will be recognised in India.

TERIAS SUAVA, Boisduval.

TERIAS SILHETANA, Wallace.

*106. TERIAS FORMOSA.

Eurema formosa, Hübner, Zuträge Ex. Schmett., figs. 979, 980 (1837).

A few examples from Tavoy and Ponsekai.

TERIAS LÆTA, Boisduval.

*107. LEPTOSIA XIPHIA.

Papilio xiphia, Fabricius, Spec. Ins., vol. ii, p. 43, n. 180 (1781).
Nychitonia xiphia, Moore, Proc. Zool. Soc. Lond., 1878, p. 837.

A single very dark female example from Sinbyoodine.

*108. CATOPSILIA CATILLA.

Papilio catilla, Cramer, Pap. Ex., vol. iii, pl. ccxxix, figs. D, E, *female* (1779).
Callidryas catilla, Moore, Proc. Zool. Soc. Lond., 1878, p. 837.

A few specimens from the hills and from Tavoy, the females showing the usual variations.

*109. CATOPSILIA CROCALE.

Papilio crocale, Cramer, Pap. Ex., vol. i, pl. lv, figs. C, D, *female* (1775).
Callidryas crocale, Moore, Proc. Zool. Soc. Lond., 1878, p. 837.

A male from Tavoy.

*110. HEBOMOIA GLAUCIPPE.

Papilio glaucippe, Linnæus, Mus. Ulr., p. 240, n. 59 (1764).

A few males from Tavoy and the hills.

*111. IXIAS, sp.

Ixias pallida, Moore, Proc. Zool. Soc. Lond., 1878, p. 837.
Ixias citrina, Moore, l. c.
Ixias moulmeinensis, Moore, l. c.

We do not know to which, if any, of these species the numerous male specimens of *Ixias* in this collection should be referred. Though they are smaller, they seem to come nearest to *I. andamana*, Moore, to which Mr. Moore says his *I. pallida* is nearest, but we cannot believe that in this very variable genus anything like the number of described species really exists. Some of the Tenasserim specimens might be also called *I. birdi*, Distant (from the Malay Peninsula), or *I. verna*, Druce (from Siam), but on the whole we prefer to leave the matter undetermined until the whole genus can be examined critically.

112. NEPHERONIA GÆA.

Eronia gæa, Felder, Reise Novara, Lep., vol. ii, p. 190, n. 188 (1865).

A male, and a female with yellow at the base of the hindwing, from Tavoy.

NEPHERONIA LUTESCENS, Butler.

Eronia lutescens, Moore, Proc. Zool. Soc. Lond., 1878, p. 838.

Has this species ever been described? Mr. Moore gives no reference to it. He records it from Sumatra, as well as from Moulmein to Meetan.

*113. CATOPHAGA NEOMBO.

Pieris neombo, Boisduval, Sp. Gén. Lép., vol. i, p. 539, n. 148 (1836).
C. neombo, Moore, Lep. Cey., vol. i, p. 131, pl. 1, fig. 3*a*, *female* (1881).

A single female from Tavoy agreeing fairly well with the above-quoted figure. It is probably, however, the opposite sex of the following species.

*114. CATOPHAGA PAULINA.

Papilio paulina, Cramer, Pap. Ex., vol. ii, pl. cx, figs. E, F, *female* (1777).

Many males from Tavoy, Ponsekai, and the hills. This is another genus which sadly requires critical revision.

115. HIPOSCRITIA INDRA.

Pieris indra, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 74, n. 143 (1857).

A few males from Tavoy and Ponsekai.

HIPOSCRITIA LAGELA.

Catophaga lagela, Moore, Proc. Zool. Soc. Lond., 1878, p. 838, pl. lii, fig. 4.

*116. HUPHINA LEA.

Pieris lea, Doubleday, Ann. and Mag. of Nat. Hist., vol. xvii, p. 23 (1846).
Appias lea, Moore, Proc. Zool. Soc. Lond., 1878, p. 838.

Numerous males, but no females, from the hills, Tavoy, and Ponsekai.

*117. HUPHINA NAMA.

Pieris nama, Moore, Horsfield and Moore, Cat. Lep. Mus. E. I. C., vol. i, p. 76, n. 148 (1857).
Appias nama, Moore, Proc. Zool. Soc. Lond., 1878, p. 838.

A few males from the hills, Tavoy, and Ponsekai.

118. HUPHINA PHRYNE.

Papilio phryne, Fabricius, Syst. Ent., p. 473, n. 131 (1775).

A few specimens from the hills and Tavoy of one of the numerous races of this wide-spread species.

HUPHINA DAPHA.

Appias dapha, Moore, Proc. Zool. Soc. Lond., 1878, p. 838.

The specimens we have identified as *H. phryne* are very near to this species, but do not quite agree with the description of it.

*119. APPIAS ZELMIRA.

Papilio zelmira, Cramer, Pap. Ex., vol. iv, pl. cccxx, figs. C, D, *female* (1780).

A few males from Ponsekai and the hills.

APPIAS AMBA, Wallace.

APPIAS VACANS, Butler.

DELIAS PASITHOE, Linnæus.

DELIAS INDICA, Wallace.

*120. DELIAS DESCOMBESI.

Pieris descombesi, Boisduval, Sp. Gén. Lép., vol. i, p. 465, n. 38 (1836).

A single female from Tavoy.

PRIONERIS WATSONI, Hewitson.

*121. PRIONERIS CLEMANTHE.

Pieris clemanthe, Doubleday, Ann. and Mag. of Nat. Hist., vol. xvii, p. 23 (1846).

Several males from Tavoy, Ponsekai, and the hills.

Subfamily PAPILIONINÆ.

*122. PAPILIO (*Euplœopsis*, subg. nov., de Nicéville) TELEARCHUS.

P. telearchus, Hewitson, Trans. Ent. Soc. Lond., new series, vol. ii, p. 22, pl. vi, fig. 3 (1852).

Three males of this fine species from Tavoy, and one from Ponsekai. *P. butleri*, Janson, figured in Distant's 'Rhopalocera Malayana,' pls. xxvii, xxvii*a*, is a near ally of this.

123. PAPILIO (*Menamopsis*, subg. nov., de Nicéville) TAVOYANUS.

P. tavoyanus, Butler, Ann. and Mag. of Nat. Hist., fifth series, vol. x, p. 373, n. 3 (Nov., 1882).

P. claræ, Marshall, Journ. A. S. B., vol. li, pt. 2, p. 42, n. 7, pl. iv, fig. 5, *male* (Dec., 1882).

Through an accident and from no fault whatever of Major Marshall's, Mr. Butler's name for this species has priority of publication. Major Marshall's paper describing it and other Tenasserim species was written and read many months (nearly a year) before Mr. Butler's paper appeared.

One male from Ponsekai.

PAPILIO (*Paranticopsis*) XENOCLES, Doubleday.

*124. PAPILIO (*Paranticopsis*) MEGARUS.

P. megarus, Westwood, Arc. Ent., vol. ii, p. 98, pl. lxxii, fig. 2 (1845).

Many males from Ponsekai and the hills.

125. PAPILIO (*Paranticopsis*) MACAREUS.

P. macareus, Godart, Enc. Méth., vol. ix, p. 76, n. 144 (1819).

Many males from the hills and Ponsekai. They are much smaller than Bornean specimens, and have less white in the interspaces of the hindwing than those from Sikkim.

*126. PAPILIO (*Chilasa*) ONPAPE.

P. onpape, Moore, Proc. Zool. Soc. Lond., 1878, p. 840.

Several males from Tavoy, Ponsekai, and the hills. They vary considerably in the amount of white on the forewing, which is usually more abundant in Tenasserim than in Indian specimens. At best this species is only a local race of *P. panope*, Linnæus, which itself is a variable and probably dimorphic species.

127. PAPILIO (*Chilasa*) CLYTIA.

P. clytia, Linnæus, Syst. Nat., ed. x, p. 479, n. 125 (1758).

A single male. In 'The Lepidoptera of Ceylon' Mr. Moore gives the *P. dissimilis* of Linnæus as a distinct species, but Mr. Distant probably more correctly unites them under the name of *P. clytia*. Collectors in the East should make great efforts to breed this species or *P. panope* from eggs laid in captivity from a known female; the results will probably be interesting. These species, however, do not deposit their eggs readily when under restraint, Mr. de Nicéville having made many attempts to induce them to do so, but always unsuccessfully.

*128. PAPILIO (*Laertias*) POLYTES.

P. polytes, Linnæus, Syst. Nat., ed. x, p. 460, n. 7 (1758).

P. pammon, Moore, Proc. Zool. Soc. Lond., 1878, p. 840.

A single male from the hills.

129. PAPILIO (*Laertias*) PITMANII, n. sp., Pl. XX, Fig. 1, ♂.

♂ UPPERSIDE, *both wings* black. *Forewing* sprinkled with golden scales, which assume the form of four streaks in the cell; two small patches of thickly placed scales at the anal angle divided by the submedian nervure in continuation of the discal band in the hindwing. *Hindwing* with a discal series of seven creamy-white spots between the veins forming a macular band, rapidly increasing from the first to the third which is the largest, the fourth longest and narrowest, the fifth, sixth and seventh subequal, the sixth slightly tinged with ochreous, the seventh entirely ochreous, with a small round deep ochreous spot below it above the anal angle. UNDERSIDE, *both wings* duller black, the golden irroration sparser, entirely absent broadly from the inner margin of the *forewing*, which bears a quadrate somewhat diffused white spot in the submedian interspace at the anal angle, with similar, but smaller and more diffused, spots in pairs in the three interspaces above in one specimen. *Hindwing* with the discal macular band as above but pure white throughout instead of creamy becoming ochreous at the anal angle as on the upperside, a marginal series of ochreous and white lunules between the veins, with white internervular lunules on the margin.

EXPANSE: ♂, 3·4 to 3·5 inches.

Allied to *P. polytes*, Linnæus, the forewing on the upperside lacking the white spots between the veins on the margin, the hindwing having the discal band broader in the middle and placed nearer the margin, and, conspicuously, in the seventh spot being ochreous, and the sixth more or less tinged with that colour. On the underside the discal band of the hindwing being continued on to the forewing at the anal angle, and the marginal lunules being ochreous and white instead of deep ferruginous and placed much nearer the margin will distinguish it from *P. polytes*; other differences as above.

Four males from Tavoy.

*130. PAPILIO (*Menelaides*) ARISTOLOCHIÆ.

P. aristolochiæ, Fabricius, Syst. Ent., p. 443, n. 3 (1775).

Many males and a few females from Tavoy, Ponsekai, and the hills.

*131. PAPILIO (*Menelaides*) DOUBLEDAYI.

P. doubledayi, Wallace, Trans. Linn. Soc., vol. xxv, p. 42, *note* (1865).

One male only from Tavoy.

*132. PAPILIO (*Byasa*) PHILOXENUS.

P. philoxenus, Gray, Zool. Misc., p. 32 (1831).

A single male in bad condition from Ponsekai. The red and white spots on the hindwing varying much in Himalayan specimens are here reduced to a minimum.

133. PAPILIO (*Byasa*) MINEREOIDES, n. sp., Pl. XX, Figs. 2, 2*b*, ♂; 3, ♀.

♂ UPPERSIDE, *both wings* black. *Forewing* with the disc paler, crossed by the deep black veins and similar streaks between the veins, two black streaks in the cell. *Hindwing* in one specimen with a trifid discal white patch beyond the end of the cell divided by the veins, with a diffused whitish spot in continuation in the submedian interspace sullied with red and black scales, and a small obscure spot also in continuation placed against the discoidal nervule; in the other specimen this discal patch is very much larger, pink instead of white, the black veins crossing it defined with rose-red, the uppermost spot above the discoidal nervule coalescing with the marginal spot beyond on one wing, while on the other wing the marginal spot is entirely merged into that portion of the discal patch occupying the second subcostal interspace; four marginal lunules placed between the veins, the three anterior ones of which are in one specimen white, the anal one only being rose-red; while the two lunules towards the anal angle are rose-red, the next above is pink, and the uppermost, as above stated, is merged into the discal patch in the other. Tail entirely black. UNDERSIDE, *forewing*, as above, though rather paler. *Hindwing* with a fifth marginal lunule in the upper subcostal interspace, white. *Antennæ* black; *palpi* and *thorax* beneath at insertion of the wings red; *abdomen* red below, black above, the segments (especally towards the the anal one) ringed with red.

♀ UPPERSIDE, *forewing* much paler, being dusky-grey. *Hindwing* with the base of the wing as far as the discal patch also dusky-grey, beyond the patch black; the patch and marginal lunules white, the former large as in one of the males. UNDERSIDE, *both wings* as in the male. *Hindwing* with the ground-colour black throughout.

EXPANSE; ♂, ♀, 3·9 inches.

Nearest allied to *P. minereus*, Gray (Lep. Ins. Nepal, p. 5, pl. i), which inhabits Nepal and Sikkim, and with which it agrees in the male in the structure of the abdominal fold of the hindwing and in the anal valves, differing from it in its smaller size and in the tail not being spotted with red; the hindwing is also proportionally broader and much shorter. We may remark here that the red cross on the upperside of the thorax shewn in Gray's figure of *P. minereus* (the specimen figured being apparently a female) is not present in any specimen of that species known to us, whilst the colouration of the thorax of *P. philoxenus* on the following plate of the same work is also equally imaginative.

P. minereoides presents an extraordinary superficial resemblance to *P. aristolochiæ*, Fabricius, which occurs with it in Burma and Siam. The male, however, may at once be distinguished from that species by the form of the abdominal fold of the hindwing and of the anal valves, and in both sexes by the longer and narrower discoidal cell of the hindwing (which is never encroached upon by the transverse discal patch), and by the underside of the same wing having only five spots (of which the two anterior are invariably white) on the margin between the veins, instead of the series of six red spots constantly present in *P. aristolochiæ*.

One male from Sinbyoodine and a pair from Ponsekai were obtained. There is also a single male in Major Marshall's collection taken in March in the Thoungyeen forests, Upper Tenasserim.

*134. PAPILIO *(Pangerana)* ZALEUCUS.

P. zaleucus, Hewitson, Ex. Butt., vol. iii, *Papilio*, pl. viii, figs. 24, *male*; 25 *female* (1865).

P. zeleucus, Moore, Proc. Zool. Soc. Lond., 1878, p. 841.

Two pairs of this fine species from Ponsekai agree with Hewitson's types. There is a *Papilio* close to, but probably separable from, *P. (Pangeranopsis) elephenor*, Doubleday, in the collection of Messrs. Godman and Salvin from Bankasoon in South Tenasserim, where it was collected by Mr. William Davison.

*135. PAPILIO *(Charus)* HELENUS.

P. helenus, Linnæus, Syst. Nat., ed. x, p. 459, n. 4 (1758).

Several males from Ponsekai, and a few from the hills.

136. PAPILIO *(Charus)* CHAON.

P. chaon, Westwood, Arc. Ent., vol. ii, p. 97, pl. lxxii, figs. 1, 1* (1845).

Two males from Ponsekai.

*137. PAPILIO (*Charus*) MAHADEVA.

P. mahadeva, Moore, Proc. Zool. Soc. Lond., 1878, p. 840, pl. li, fig. 1, *male*.

Numerous males from the hills and one from Sinbyoodine, but no female. Most of the specimens (as in some specimens of the male of *P. castor*, Westwood) have a white dot at the end of the cell of the forewing not shewn in Mr. Moore's figure nor mentioned in his description, and this is always seen on the underside. The inner series of marginal lunules on the hindwing varies in breadth.

*138. PAPILIO (*Iliades*) ANDROGEUS.

P. androgeos, Cramer, Pap. Ex., pl. xci, figs. A, B, *male* (1776).

Several males but no females from the hills.

139. PAPILIO (*Harimala*) PARIS.

P. paris, Linnæus, Syst. Nat., ed. x, p. 459, n. 3 (1758).

A few males from Tavoy, Ponsekai, and the hills.

*140. PAPILIO (*Zetides*) AGAMEMNON.

P. agamemnon, Linnæus, Syst. Nat., ed. x, p. 462, n. 21 (1758).

A few males from Ponsekai and the hills.

141. PAPILIO (*Zetides*) TELEPHUS.

P. telephus, Felder, Reise Nov., Lep., vol. i, p. 64, n. 49 (1865).

Very numerous males, but no females, from Ponsekai and the hills.

*142. PAPILIO (*Dalchina*) SARPEDON.

P. sarpedon, Linnæus, Syst. Nat., ed. x, p. 461, n. 14 (1758).

Several males from Tavoy, Ponsekai, and the hills.

*143. PAPILIO (*Pathysa*) ANTIPHATES.

P. antiphates, Cramer, Pap. Ex., vol. i, pl. lxxii, figs. A, B (1775).

Many males from Ponsekai and the hills.

144. PAPILIO (*Pathysa*) AGETES.

P. agetes, Westwood, Arc. Ent., vol. ii, p. 23, pl. lv, figs. 1, 2 (1843).

One male from Ponsekai.

145. PAPILIO (*Pathysa*) NOMIUS.

P. nomius, Esper, Ausl. Schmett., pl. lii, fig. 3 (1785—1798).

Very abundant males from Ponsekai and the hills, which, though varying somewhat in the breadth of the black bands on the forewing, have them rather broader than some continental Indian specimens.

146. PAPILIO (*Pathysa*) HERMOCRATES.

P. hermocrates, Felder, Reise Novara, Lep., vol. i, p. 57, n. 44, pl. xii, fig. e (1865).

Several males from the hills. They differ slightly *inter se* in the width of the black bands, but the narrowest-banded ones agree exactly with Felder's figure of this species, which was described from Luzon.

They differ from a long series of *P. anticrates*, Doubleday, in Mr. de Nicéville's collection taken by Mr. Otto Möller this spring in Sikkim, in having the discal black band on the upperside of the hindwing always continuous, instead of being always more or less macular though variable.

147. PAPILIO (*Orpheides*) ERITHONIUS.

P. erithonius, Cramer, Pap. Ex., vol. iii, pl. ccxxxii, figs. A, B (1779).

One or two males from Tavoy.

148. ORNITHOPTERA RHADAMANTHUS.

O. rhadamanthus, Boisduval, Sp. Gén. Lép., vol. i, p. 180, n. 8 (1836).

Two males from Sinbyoodine and one from Tavoy.

*149. LEPTOCIRCUS MEGES.

Papilio meges, Zinken-Sommer, Nova Acta Ac. Nat. Cur., vol. xv, p. 161, n. 14, pl. xv, fig. 8, *male* (1831).

Leptocircus virescens, Moore, Proc. Zool. Soc. Lond., 1878, p. 841.

Several males from Tavoy and Ponsekai. To be distinguished from specimens of *L. curius*, Fabricius, from Assam, by the subbasal band across both wings being pale green instead of white.

Family HESPERIIDÆ.

CHOASPES BENJAMINII, Guérin.

Ismene benjamini, Moore, Proc. Zool. Soc. Lond., 1878, p. 841.

150. PIRDANA RUDOLPHII, n. sp., Pl. XX, Fig. 6, ♂.

♂ UPPERSIDE, *both wings* rich brown, tinted with vinaceous. *Forewing* with the *cilia* concolorous with the rest of the wing. *Hindwing* with the *cilia* orange from the anal angle to the first median nervule, broadest in the middle, from the first median nervule to the apex concolorous with the wing. UNDERSIDE, *both wings* with the ground-colour as above. *Forewing* with the inner margin broadly to the first median nervule pale ochreous, the costa and upper half of the cell and all the veins except the median and submedian nervures and the first median nervule streaked with bronzy-green. *Hindwing* with the cell and all the veins and abdominal margin streaked with bronzy-green, the *cilia* at the anal angle orange as above, but rather broader. *Head* and *body* above concolorous with the wings on the upperside, *palpi*, *thorax*, and underside of body orange. *Antennæ* dark brown throughout except the tip of the club on the underside which is paler. No secondary sexual characters.

EXPANSE; ♂, 2·00; ♀, 2·25 inches.

Allied to *Hesperia ismene*, Felder (Reise Nov., Lep., vol. iii, p. 512, n. 894, pl. lxxiii, figs. 4, 5, *male* (1867), from Celebes, from which it differs in having the cilia only of the hindwing on both sides at the anal angle orange: in *H. ismene* the anal angle of the wing is broadly orange, as are also the last three segments of the abdomen on the upperside. It is also allied even more closely to *Pirdana hyela*, Hewitson (Distant, Rhop. Malay., p. 376, n. i, pl. xxxv, fig. 6, *female* (1886), which in the extent of the yellow area at the anal angle is about intermediate between it and *P. ismene*, and agrees with it in having the body dark brown, not yellow, above. It is also more distantly allied to *C. benjaminii*, Guérin.

A single male from Tavoy.

In Colonel Lang's collection is a very old specimen from Sikkim without head or abdomen which we believe to be the female of this species. On the upperside of both wings it is obscurely glossed with green on the basal two-thirds, the forewing is rather broader, the outer margin slightly convex, which in the male is slightly concave; and on the hindwing the orange colouring at the anal angle is rather broader (not nearly so broad as in *P. ismene* or *P. hyela*), and the cilia are throughout orange. Underside paler than in the male, the ground-colour obscure green rather than brown, the orange colouration at anal angle of hindwing as on upperside, but rather broader.

MATAPA DRUNA, Moore.

Ismene druna, Moore, Proc. Zool. Soc. Lond., 1878, p. 842.

TAGIADES PRALAYA, Moore.

*151. TAGIADES MEETANA.

T. meetana, Moore, Proc. Zool. Soc. Lond., 1878, p. 842, pl. liii, fig. 1, *male*.

Two males from Tavoy.

152. TAGIADES ALICA.

T. alica, Moore, Proc. Zool. Soc. Lond., 1877, p. 593, pl. lviii, fig. 11, *male*.

Several specimens from Tavoy agreeing with typical specimens of this species from the Andamans. They differ from *T. meetana* in having the upperside of the hindwing broadly white, not slightly white-speckled between the veins, as in that species, and the cilia white throughout instead of being tipped with dark brown.

153. TAGIADES RAVI.

Pterygospidea ravi, Moore, Proc. Zool. Soc. Lond., 1865, p. 779.

Two males and one female from Tavoy agreeing exactly with specimens from Bengal and the Andamans.

*154. KERANA DIOCLES.

Nisoniades diocles, Moore, Proc. Zool. Soc. Lond., 1865, p. 787.

Astictopterus diocles, Moore, Proc. Zool. Soc. Lond., 1878, p. 842.

Three males from Tavoy rather smaller than eastern Himalayan specimens.

ASTICTOPTERUS SUBFASCIATUS, Moore.

155. ASTICTOPTERUS OLIVASCENS.
A. olivascens, Moore, Proc. Zool. Soc. Lond., 1878, p. 692.

One female from Tavoy so named by Mr. Moore.

156. ASTICTOPTERUS SALSALA.
Nisoniades salsala, Moore, Proc. Zool. Soc. Lond., 1865, p. 786.

A male specimen from Tavoy agrees with North Indian examples. *A. stellifer* of Butler is hardly distinguishable from this species.

157. ASTICTOPTERUS XANITES.
A. xanites, Butler, Trans. Ent. Soc. Lond., 1870, p. 510.

One pair from Tavoy.

TELICOTA BAMBUSÆ, Moore.
Pamphila bambusæ, Moore, Proc. Zool. Soc. Lond., 1878, p. 842.

CHAPRA MATHIAS, Fabricius.
Pamphila mathias, Moore, Proc. Zool. Soc. Lond., 1878, p. 843.

PARNARA MOOLATA.
Hesperia moolata, Moore, Proc. Zool. Soc. Lond., 1878, p. 843.

Mr. Moore says that this species is allied to *Hesperia kumara.* In "The Lepidoptera of Ceylon" Mr. Moore places this latter species in the genus *Baoris*, which typically in the male has a dense tuft of long hair in the middle of the hindwing on the upperside, which is lacking in *moolata* and *kumara ;* these latter therefore would apparently go better into the genus *Parnara.*

158. BAORIS OCEIA.
Hesperia oceia, Hewitson, Desc. *Hesperidæ*, p. 31, n. 22 (1868).

Two pairs from Tavoy, and a female from Ponsekai. As usual, the specimens are variable ; in Sikkim, this variation in one extreme has no hyaline spots at all on the forewing, in the other extreme there are ten such spots. Two of these varietal forms have been described by Mr. Moore as *Baoris unicolor* and *B. scopulifera*, *vide* de Nicéville, Journ. A. S. B., vol. lii, pt. 2, p. 85, n. 29, pl. x, fig. 11, *female*, 1883, where the former is figured under its correct name, *B. oceia.*

*159. PLESIONEURA AURIVITTATA.
P. aurivittata, Moore, Proc. Zool. Soc. Lond., 1878, p. 843, pl. liii, fig. 2.

Three or four males and a female from Tavoy of this distinct species.

PLESIONEURA ALBIFASCIA, Moore.

160. PLESIONEURA ALYSOS.
P. alysos, Moore, Proc. Zool. Soc. Lond., 1865, p. 789.

Some specimens from Tavoy and Ponsekai.

161. PLESIONEURA NIGRICANS.

P. nigricans, de Nicéville, Journ. A. S. B., vol. liv, pt. 2, p. 123, pl. ii, fig. 6, *female* (1885).

One female from Tavoy differing from the type specimen figured in the discal hyaline band on the forewing being somewhat wider.

162. PLESIONEURA LEUCOCERA.

Hesperia leucocera, Kollar in Hügel's Kaschmir, vol. iv, pt. 2, p. 454, n. 2, pl. xviii, figs. 3, 4 (1848).

Two female specimens from Tavoy and one from Ponsekai of this wide-spread species.

163. PITHAURIA STRAMINEIPENNIS.

P. stramineipennis, Wood-Mason and de Nicéville, Journ. A. S. B., vol. lv, pt. 2, p. 388, n. 234, pl. xv, fig. 5, *male* (1887).

One male from Ponsekai agrees with Sikkim specimens.

164. HALPE BETURIA.

Hesperia beturia, Hewitson, Desc. *Hesperidæ*, p. 36, n. 31 (1868).

Three males from Tavoy which agree with Bengal examples.

165. ANTIGONUS SURA.

Achlyodes sura, Moore, Proc. Zool. Soc. Lond., 1865, p. 786.

Two examples from Tavoy and one from Ponsekai.

ISOTEINON SUBTESTACEUS, Moore.

166. ISOTEINON INDRASANA, n. sp., Pl. XX, Fig. 5, ♀.

♀ UPPERSIDE, *both wings* brown with a ferruginous gloss. *Forewing* with a small round subapical dot, a similar spot but twice the size at the lower outer end of the discoidal cell, a slightly larger triangular one in the second median interspace, and a large quadrate one in the first median interspace, all semitransparent yellow; an elongated spot touching the middle of the submedian nervure in the submedian interspace opaque yellow. *Cilia* cinereous. *Hindwing* with an obscure yellow patch on the middle of the disc. *Cilia* ochreous. UNDERSIDE, *forewing* with the costa broadly, and the apical half of the wing decreasing to a point at the anal angle dark ochreous, the rest of the wing fuscous; the spots as above. *Cilia* fuscous, becoming ochreous towards the anal angle. *Hindwing* dark ochreous thoughout, the veins a little paler. *Cilia* ochreous. *Antennæ* wanting. *Head* and *body* above dark brown, beneath ochreous.

EXPANSE: ♀, 1·35 inches.

A single example from Tavoy. We do not know any species to which *I. indrasana* is nearly allied.

*167. ISOTEINON MASONI, Pl. XX, Fig. 4, ♂.

Pamphila masoni, Moore, Proc. Zool. Soc. Lond., 1878, p. 842, pl. lii, fig, 5, *male*

♂ UPPERSIDE, *both wings* dark brown. *Forewing* with two conjoined spots placed obliquely near the end of the cell, two subapical dots, the lower four times the size of the upper, a quadrate spot in the second median interspace, a similar one but three times the size in the first median interspace, two spots in continuation in the submedian interspace, all bright ochreous. *Cilia* cinereous. *Hindwing* with a small patch of yellow in the middle of the disc. *Cilia* ochreous. UNDERSIDE, *forewing* with the costa narrowly, the apex widely, decreasing rapidly to the anal angle, bright ochreous, the rest of the wing black; the spots as above, but the lower of the two in the submedian interspace much larger and diffused, two short dark streaks placed outwardly against the subapical dots, beyond which is a submarginal series of obscure spots of a paler yellow than the ground on which they are placed. *Cilia* dark brown. *Hindwing* bright ochreous, with an obscure discal series of dark spots, of which the one in the upper subcostal interspace is alone prominent. *Cilia* ochreous defined inwardly by a fine dark brown line. *Antennæ* with the shaft above fuscous, the anterior half of the club ochreous, the anterior half of the shaft below ochreous; *palpi*, *head*, and *body* above dark brown, below ochreous. No secondary sexual characters.

EXPANSE: ♂, 1·15 inches.

Marked almost exactly as in *Halpe honorei*, de Nicéville (which however may be an *Isoteinon*, the male being unknown), from South India, but all the spots on the forewing smaller, the one in the discoidal cell nearly divided into two portions, the discal patch on the hindwing less than half the size, and the insect itself smaller. A single specimen only was obtained from Tavoy. This species has been figured and redescribed under the impression that it was new: the specimen was sent to Mr. Moore for identification, he returned it labelled "not in coll. F. M.," and we therefore came to the conclusion that it was unknown. Judging from the figure alone, it appears to us that Moore's type specimen was a female, he described it, however, as a male. It is considerably larger than our male.

EXPLANATION OF PLATE XX.

Fig. 1. *Papilio pitmanii*, n. sp., ♂.
Fig. 2. ——— *minereoides*, n. sp., ♂.
Fig. 2*b*. Upperside of a hindwing of another male specimen.
Fig. 3. *Papilio minereoides*, ♀.
Fig. 4. *Isoteinon masoni*, Moore, ♂.
Fig. 5. ——— *indrasana*, n. sp., ♀.
Fig. 6. *Pirdana rudolfii*, n. sp., ♂.

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